Living the American Dream: How Norway Became a High-Mobility Country*

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Abstract

I estimate long-run trends in intergenerational mobility in income in Norway for a period that includes World War II and the creation of the welfare state. I show that persistence between fathers and sons was high in the early 20th century but decreased substantially for cohorts born between the 1920s and 1940s. The convergence of incomes between rural and urban areas explains about half the total fall in persistence. First, I relate this result to changes in education by using plausibly exogenous variation in the intensity of schooling from a primary school reform, which reduced the gap between cities and rural areas, and find that it significantly decreased persistence in incomes across generations. Second, I show that the returns to education fell dramatically at the beginning of World War II. Comparing persistence for a set of father-son pairs but using income for the father measured just before and after this shock, I find that the onset of World War II lowered persistence in income. These results suggest that equal access to education and a compressed income distribution are two key drivers behind Norway's transition to high mobility.

1 Introduction

Inequality has risen throughout Western countries since at least the 1980s, leading to concerns that children growing up in poor households today do not have the same opportunity for upward mobility as their parents (Corak, 2013; Piketty, 2017). In cross-country comparisons, the Scandinavian welfare states outperform most countries on measures of relative intergenerational mobility in income – meaning that relative incomes in Norway, Denmark and Sweden are less tied to that of their parents than in almost any other country. However, despite the importance of

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this topic for policymakers and researchers, we have little evidence of how the high rates of mobility in Scandinavia came about.

It could be that the Scandinavian countries have always been more mobile than other Western countries. Previous research has found that trends in intergenerational income mobility in the Scandinavian countries have been flat for male cohorts born at least since 1951 (Ahrsjö, Karadakic and Rasmussen, 2023). Other studies use tax data from the 1960s and onward and find evidence of lower income mobility for cohorts born between the 1930s and 1950s (Pekkala and Lucas, 2007; Björklund, Jäntti and Lindquist, 2009; Pekkarinen, Salvanes and Sarvimäki, 2017). However, if income inequality directly impacts intergenerational mobility, we would want to measure incomes before the large compression in incomes that happened in many Western countries in the 1940s and 1950s (Abel, Abramitzky and Salvanes, 2024). Unfortunately, the type of historical individual-level data on income linked with family ties that would be needed usually does not exist (Mogstad and Torsvik, 2023; Black and Devereux, 2011).[1]

In this paper, I estimate intergenerational mobility in income in Norway for sons born since the early 1900s – when income inequality was high, transfers to the poor were limited, and the welfare state was still only in its early infancy – and show how it has evolved until today. After showing that intergenerational mobility in income was very low in the early 20th century, I analyze potential causal drivers of income mobility, trying to understand how Norway became a high-mobility society. I use a dataset spanning almost a century by combining modern Norwegian tax registers from 1967 with a novel dataset of individual-level incomes from 1925 to 1964 (Abel and Salvanes, 2024), which I link with information on family ties to estimate intergenerational mobility in income for cohorts born between 1910 and 1980. The dataset allows me to construct a measure of lifetime income by using multiple observations on income for each person.

I first show that persistence in income rank across generations for sons born in the 1910s and 1920s was more than twice as high as today's, with a rank-rank persistence of about 0.55 compared to 0.20 today. The decrease in persistence happened for cohorts born in the early 1920s to 1940s, and the level has remained relatively constant ever since. This shows that Norway has not always been the mobile society it is today, and that the high mobility must have been caused by something happening primarily to cohorts born in the first part of the 1900s. To better understand these country-wide patterns, I follow Jácome, Kuziemko and Naidu (2021) and isolate the part of the rank-rank persistence coming from differences in incomes between rural and urban areas. Cohorts born in cities before 1935 earn better as adults than those growing up in rural areas, even if their fathers have the same income. The gap between urban and rural areas was dramatically reduced during and after World War II and virtually disappeared by the late 1980s. Given a set

[1]This has spurred an extensive literature in economic history using measures from sociology and other alternative measures of intergenerational mobility by using data on occupations from linked census data (see, e.g., Björklund, Jäntti et al., 1999; Long and Ferrie, 2013) and most recently survey data (Jácome, Kuziemko and Naidu, 2021).

of assumptions, this reduction has contributed to a 16 percentage point reduction in rank-rank persistence – or almost half the overall decline in this period.

In the second part of the paper, I investigate possible causal drivers of the increase in mobility. Changes in mobility can result from pre-market, market or post-market factors. I focus on the first two by looking at education (pre-market) and the returns to education (labor market), and close down the direct effect of post-market factors by looking at income measured pre-tax and pre-transfers. First, I investigate the role of education in explaining the increase in intergenerational mobility in income. Education is a key determinant of income, so we might expect a reduction in inequalities in educational attainments to decrease persistence in income across generations. The gap in educational attainment between rural and urban areas was large for cohorts born before the 1930s but started to decline thereafter. To provide direct evidence of this mechanism, I use variation from the implementation of the 1936 rural primary school reform in Norway, which differentially increased weeks of schooling during primary school for different municipalities and cohorts, as a basis for causal inference. I find that the reform decreased persistence in income rank by more than five percentage points, or about one-seventh of the overall fall in persistence in this period.

Second, I investigate the role of the returns to education in explaining income mobility. A change in the returns to education could impact mobility by changing the pay for already educated individuals or the incentives to pursue additional education. I show that the returns to education dropped sharply in 1940-1942 from around 15 to 8 percent and use this as a shock to the returns to education (and wage structure more broadly). The shock impacts incentives to invest in education, but year-to-year adjustments for individuals already in the labor force are expected to be small. I estimate persistence for a set of father-son pairs changing only the year for which I measure the father's income. Comparing estimates of intergenerational persistence using fathers' income from just before and after 1940, I find a decrease from almost 0.30 to about 0.26 – a four percentage point decline in income persistence. There are no such changes in persistence for the years leading up to or following 1940.

This paper makes three main contributions to our understanding of intergenerational mobility. First, I contribute to a large and growing literature estimating historical rates of intergenerational mobility (e.g., Ferrie, 2005; Long and Ferrie, 2013; Modalsli, 2017; Song et al., 2020; Berger et al., 2023; Ward, 2021; Jácome, Kuziemko and Naidu, 2021). This literature typically uses linked decennial population censuses and investigates either persistence in occupation or income imputed from occupation. Such imputations cannot typically pick up year-to-year income changes, which is important for studying the interaction between income inequality and intergenerational mobility. The imputations also overlook the income disparities within occupations and are typically restricted to a low number of occupational categories. I solve these

challenges using a novel dataset on individual-level incomes from the 1920s until today (Abel and Salvanes, 2024).

Only a few historical studies have access to individual incomes. Feigenbaum (2018) links the 1915 Iowa census with the 1940 US census to estimate intergenerational mobility in income for a sample in the US, but only has access to income from these two years. Jácome, Kuziemko and Naidu (2021) uses historical survey data with information on family income and fathers' occupation to estimate relative intergenerational persistence in income for a representative population born between 1910 and 1970 in the US. They find that intergenerational persistence in income ranks decreased substantially for cohorts between the 1910s and 1940s and was virtually flat until the 1970s. This differs from most papers using occupational data from censuses, which find mostly stable persistence rates. However, it closely matches new findings from Ward (2021), looking at intergenerational mobility in the US while correcting for measurement error and including Black families. It also closely mirrors the results in this paper for Norway.

Second, I contribute to the empirical literature on schooling and intergenerational mobility by providing causal evidence of the importance of education in explaining Norway's rise to a high-mobility country. In Scandinavia, researchers have argued about the equalizing impact of early education.[2] However, these papers cannot speak to the causal effect of the expansion of education in the first half of the 20th century, when we know that much of the improvements in mobility happened. In the context of the early 20th century US, it has been shown that the Rosenwald schools had the highest gains in the most disadvantaged counties, suggesting it could have reduced intergenerational mobility (Aaronson and Mazumder, 2011). Similarly, Card, Domnisoru and Taylor (2022) use data from the 1940 census and show that school quality increased upward mobility in relative levels of education. Still, they do not link their results to broader changes in the trends in income mobility rates over time. A contrarian view is offered by Parman (2011), suggesting that the expansion of public education in the US in the early 20th century decreased mobility.

Finally, I contribute to a growing literature on the so-called the "Great Gatsby Curve", meaning the negative relationship between inequalities and intergenerational mobility (Corak, 2013). This literature has mostly focused on the transmission of education, social networks, neighborhood effects and liquidity constraints as potential reasons for this relationship. It has been difficult to isolate specific factors because nations or areas with different levels of inequality also differ along other dimensions. This paper isolates the effect of a change in the wage structure during World War II, arguing that part of the negative relationship between inequality and mobility is mechanical. A more specific version of this argument is made by Jácome, Kuziemko and Naidu (2021), who

[2]See Karlson and Landersø (2021); Pekkarinen, Salvanes and Sarvimäki (2017); Pekkarinen, Uusitalo and Kerr (2009); Pekkala and Lucas (2007); Björklund, Jäntti and Lindquist (2009).

show that reducing the black-white income gap mechanically increased US mobility rates in the mid-20th century.

This paper is structured as follows. First, I provide an overview of Norway during the 20th century and a review of changes in inequalities. Second, I describe how I construct my full linked dataset. Third, I present evidence on levels and trends in intergenerational mobility in income, focusing on the rural-urban gap. Fourth, I present causal evidence on the effect of education and a change in the wage structure on intergenerational mobility. Finally, I discuss my results and conclude.

2 Historical Background

This paper investigates intergenerational mobility in income for cohorts born in the 20th century, when Norway transformed itself from a rural country dominated by farming and fishery to one of the richest in the world (Grytten, 2020). To better understand the history and institutions affecting rates of intergenerational mobility, I first provide an overview of Norway's economic transformation in this period before detailing how the welfare state was developed with the ambition to create equal chances for success in life for all its inhabitants. I further detail what we know about changes in inequalities in economic outcomes and health in Norway during the 20th century, which could have key implications for levels of mobility. I pay particular attention to forces impacting cohorts born in the first half of the 20th century, as my findings indicate that mobility was increasing during this period.

2.1 Norway During the 1900s

In the 1880s, Norway was predominantly rural, with most people working in farming, fishery, and forestry. While it has been portrayed as poor and underdeveloped, Norway was likely quite average among the developed countries in Western Europe in terms of GDP per capita (Myhre, 2022; Grytten, 2020). It also had among the lowest infant mortality rates in the world, the highest life expectancy in northern Europe and ranked among the highest in reading and writing skills (Regidor et al., 2011). It seems fair to say that Norway was a reasonably developed country long before the development of the welfare state.

Compared to other countries in Western Europa, industrialization in Norway happened relatively late, with 11.9 percent of the working population employed in manufacturing at the turn of the century mainly concentrated in larger cities (Leknes and Modalsli, 2018; Venneslan, 2009). It wasn't until 1905, when Norway got its independence from Sweden and "Norsk Hydro" started up its electricity-intensive production of aluminum, that industrialization started to take off. In the following 30 years, more than 140 hydroelectric power plants were constructed, mostly

in rural areas, providing electricity to local energy-intensive industries. This development brought a great structural transformation of the Norwegian economy, increased resources and improved long-term health (Leknes and Modalsli, 2018; Karadakic, 2023). Norway reached peak industrialization after World War II, with 35 percent of its workforce working in manufacturing and experienced significant deindustrialization beginning in the 1970s (Grytten, 2020).

Employment in agriculture, fishery and forestry remained relatively constant until after World War II, when employment, particularly in agriculture, started to decline. These sectors struggled with overproduction and low real incomes during the inter-war period, and underemployment was a massive problem. The German occupation in 1940 led to a short-term standstill in the economy, but only months after the capitulation, the economy was booming, and unemployment quickly disappeared (Abel, Abramitzky and Salvanes, 2024; Ingulstad, Hatlehol and Frøland, 2017). Disruptions to trade, the presence of foreign troops and workers, and substantial investments in manufacturing and infrastructure led to a surge in demand for food and raw materials, resulting in wage increases in the previously struggling primary sectors (Abel, Abramitzky and Salvanes, 2024). Technological advancements reached the agriculture sector after World War II when the adoption of mechanical milking machines induced young women to find alternative work in the cities (Ager, Goñi and Salvanes, 2023).

The years following World War II saw unprecedented GDP growth, and the period 1950-1973 has been known as "the golden years" in Norwegian history for its low levels of unemployment and stable inflation (Grytten, 2008). Oil was found in the North Sea in 1969, and production began in the 1970s. This supported a growing public sector and new and large transfer programs initiated by the Norwegian Labor Party. The stable economic situation stands in contrast to that of the inter-war years – with high peaks and low troughs. The two highest peaks came in 1916 and 1930, with GDP about eight percent above trend. The peak in 1930 was the highest economic upturn in Norway of the 20th century (Eika, 2008). The largest troughs came in 1919 and 1921, with GDP about 11 and 8 percent below trend, respectively.

2.2 The Development of the Welfare State

Historically, the responsibility for social problems was predominantly borne by families, churches, and individual parishes. However, in the 18th and 19th centuries, the Norwegian authorities began implementing public measures to combat poverty and social distress. Throughout the 19th century, public benefits remained minimal, and their use was associated with considerable social stigma. The early seeds of the welfare state came in the first part of the 20th century, with some municipalities taking on the role of pioneers and introducing welfare programs themselves, such as unemployment and retirement benefits.

While the ideas for the Norwegian welfare state came decades before World War II, the real breakthrough happened after World War II (Acemoglu et al., 2021). The Norwegian Labor Party had been in power since 1935 but was in exile in London during the war. It received a strong mandate for change during the election of 1945 and remained in power more or less until 1965. It was during this period that historian Jens Arup Seip coined "the one-party state", and the labor party was able to pass reforms such as universal unemployment insurance and public pensions (Sejersted, 2021; Seip, 1994). The Norwegian Labor Party was focused on decreasing inequalities further and increasing the welfare of the middle and lower classes.

Education was at the center of the policy debate on inequalities. The 20th century started with vastly different quality and quantity of primary schooling in rural and urban areas, which was reinforced by vast differences in the likelihood of advancing to higher levels of education (Acemoglu et al., 2021). This gap was partly closed throughout the 20th century with primary school reforms in 1936 and 1955, before the laws dictating the primary schooling systems in rural and urban areas were merged in 1959. This was part of a greater idea of creating one schooling system for everyone and making secondary and higher education independent of where and to which parents you were born.

Finally, tax policies were another arena for reducing inequalities and the primary way the welfare state was financed. This area remains heavily understudied in Norway, but it is clear that both income and wealth taxes increased and were made more progressive during and after World War II. This was all a part of their ambition to replace private savings with public savings and to distribute financing to firms as loans through public institutions and direct investments. The Norwegian historian Francis Sejersted later stated that "[...] true to Social Democracy's hegemonic nature, no one really stood up for the rich, the real capitalists" (Sejersted, 2021). While the measures that the Labor Party passed were drastic by today's standard, they represented a moderation of the previous anti-marked stands of the Labor Party.

2.3 Inequality in Income, Wealth and Health

Inequalities of economic and non-economic factors might directly impact the next generation and thus strengthen intergenerational persistence (Corak, 2013). During the 1900s, Norway implemented a range of policies aimed at decreasing inequality through increasing educational attainment (Abel, Buetikofer and Salvanes, 2023; Acemoglu et al., 2021; Black, Devereux and Salvanes, 2005) and improving health among those from low SES families (Bütikofer, Mølland and Salvanes, 2018; Bütikofer, Løken and Salvanes, 2019; Bütikofer and Salvanes, 2020). I will, therefore, briefly review changes in inequality occurring in Norway during the 1900s, which could have a direct impact on intergenerational mobility in income and social mobility more broadly.

While it has been suggested that Norway had low levels of inequality for a long time, research on inequality in income and wealth suggests that it was significantly higher at the turn of the 20th century than today – with large drops in inequality occurring during World War II and in the post-war period (Aaberge, Atkinson and Modalsli, 2020; Abel, Abramitzky and Salvanes, 2024). I plot estimates of the pre-tax Gini coefficient for taxpayers from 1925 to today in Figure 1, using a sample of counties that I can consistently follow until today (Abel, Abramitzky and Salvanes, 2024). The income Gini coefficient seems to have been high, in the interval 50-60 percent, before the Second World War, before dropping by 20 percentage points and stabilizing after 1955. This broadly mirrors the results from other studies on Norway in this period (Berger and Vagle, 2017; Aaberge, Atkinson and Modalsli, 2020; Berger and Vagle, 2017). Top income shares closely follow this development (Aaberge and Atkinson, 2010; Berger and Vagle, 2017). Wealth follows a similar trend, but this is less studied and surrounded by more uncertainty (Aaberge, Modalsli and Solbakken, 2018; Roine and Waldenström, 2015).

Inequalities in health are difficult to measure consistently across time, and to my knowledge, no research has been able to look at this in Norway in the very long run. Bütikofer, Karadakic and Salvanes (2021) study inequalities in mortality over the income distribution and find that income gradient in infant mortality across municipalities was flat by the late 1960. The gradient for older ages across municipalities and the individual-level income gradient in infant mortality lasted into the 21st century. To look at the very long run, I plot the Gini coefficient for the age of death for each death cohort between 1900 and 2014 in Figure 2. It starts noisily for cohorts who die at the beginning of the century but drops sharply following the end of World War I and the Spanish flu. There was a temporary increase during World War II before the Gini coefficient again declined and gradually flattened out at around 10 percent. This means that the variation in age of death has been massively reduced during the 20th century, but whether this comes from a reduction in inequalities in health between rich and poor or a decrease in idiosyncratic early death is unclear.

3 Data and Measurement

This paper combines newly digitized data from Norwegian tax registers from 1925 to 1965 and modern tax registers from 1967 to 2014 with information on parents to estimate intergenerational mobility for birth cohorts between 1910 and 1980. The resulting dataset contains multiple observations on taxpayers' income from the yearly tax assessments. I use modern population registers to identify parents whenever possible and link them to the historical income data using fuzzy string matching. To determine the transmission of a broader set of characteristics, I also include data on educational attainment from the population censuses and the Norwegian Educational Register.

3.1 Individual-level Historical Income Data

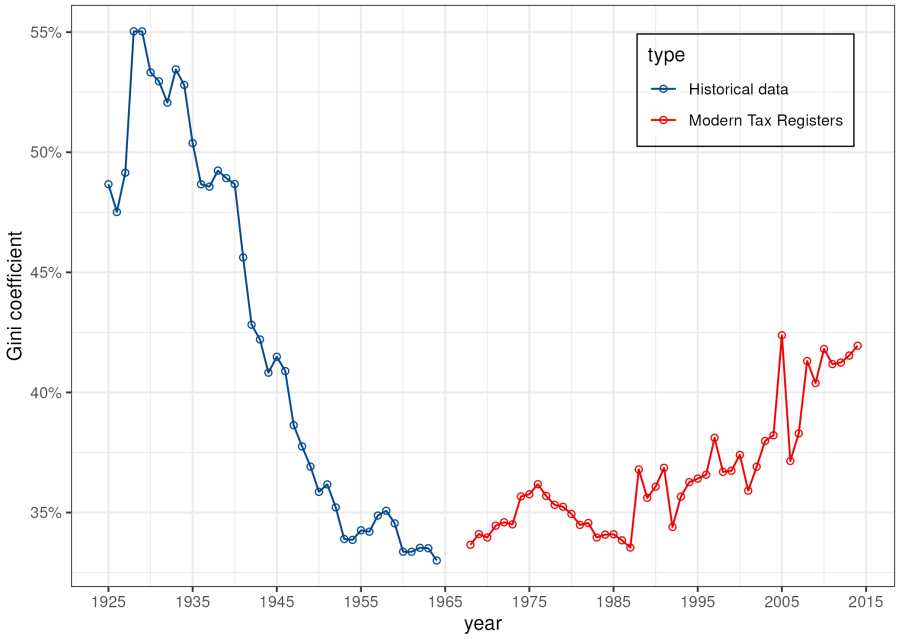
I use newly digitized individual-level data with information from Norwegian tax authorities, including information on name, occupation, place of residence, income, and wealth (Abel and Salvanes, 2024). These records have been open to the public since the modern income and wealth tax was created at the turn of the 1880s and include data on all who paid taxes (Gerdrup, 1998). The dataset is constructed by digitizing a previously overlooked series of county-level Norwegian address books published since 1900, resulting in more than 16 million individual observations. The address books were published only infrequently for the first decades but started being published regularly in the 1920s and 1930s.

The series of address books typically lists the name, occupation, place of residence, income and wealth of all taxpayers. An example of such a page from the source material is given in Figure 3. The pages were digitized with a primarily automated routine, using computer vision (CV), optical character recognition (OCR) and machine learning (ML) learning methods (Abel and Salvanes, 2024). The pipeline had three main parts: First, pre-processing the images and identifying columns with relevant text and second, reading the columns using OCR. Third, the data is structured using a combination of *regular expression*, named entity recognition and text classification. A fourth step performs a long series of post-processing steps to remove noise and add more data. See Abel and Salvanes (2024) for the full documentation of this dataset, the digitization process, and quality checks.

We want to follow a consistent set of counties over time and, therefore, operate with two samples: Counties that I can follow from 1925 and those I can follow from 1935. Whenever data from modern tax registers are used in the same calculation or figures, the sample is selected to reflect this. I also drop individuals without positive recorded incomes and those who do not pay taxes, as this reflects the sample of taxpayers that would be included in the historical tax register. Since the books are typically published every other year, missing years are interpolated using observations from the year before. The exception is from 1936 to 1947, when I use aggregated municipality-level income data to interpolate incomes. Precise adjustments for these years are particularly important because there were large changes in incomes between municipalities, and the absence of such adjustments would make estimates choppy.

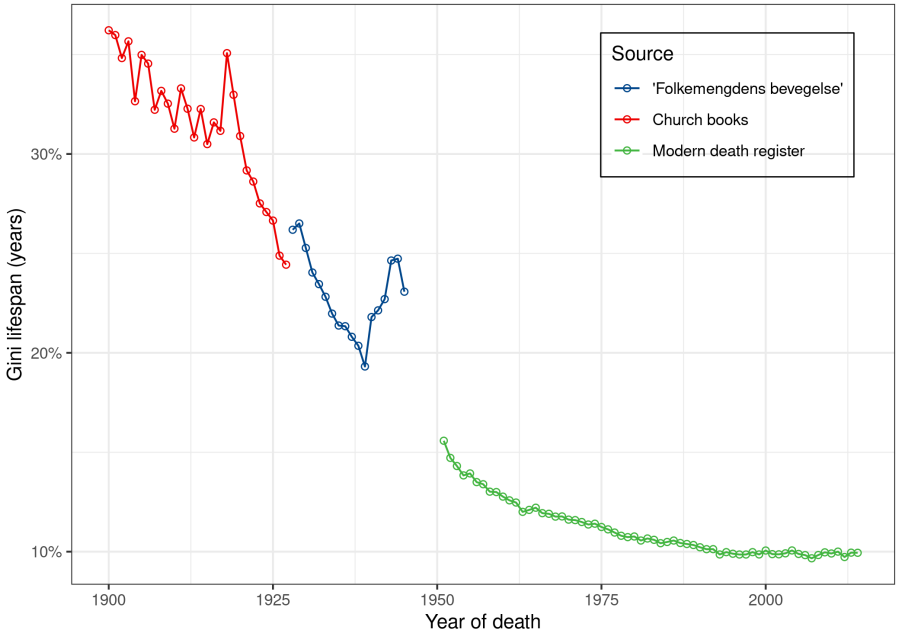
The definition of income in the dataset follows that of the Norwegian tax system, which lists income before most deductions and taxes (Gerdrup, 1998; Berger and Vagle, 2017). Income includes wages, financial income and net income from self-employment. The income measure includes work-related cash transfers, such as unemployment benefits and short-term sickness benefits at least since 1967 (Bhuller, Mogstad and Salvanes, 2017). Although the tax system changed in certain respects during this period, the basic income definition used is the same throughout the whole period and is the same as that used in the modern tax register from 1967. Income and wealth were

Figure 1: Pre-tax Income Gini Coefficient for Taxpayers



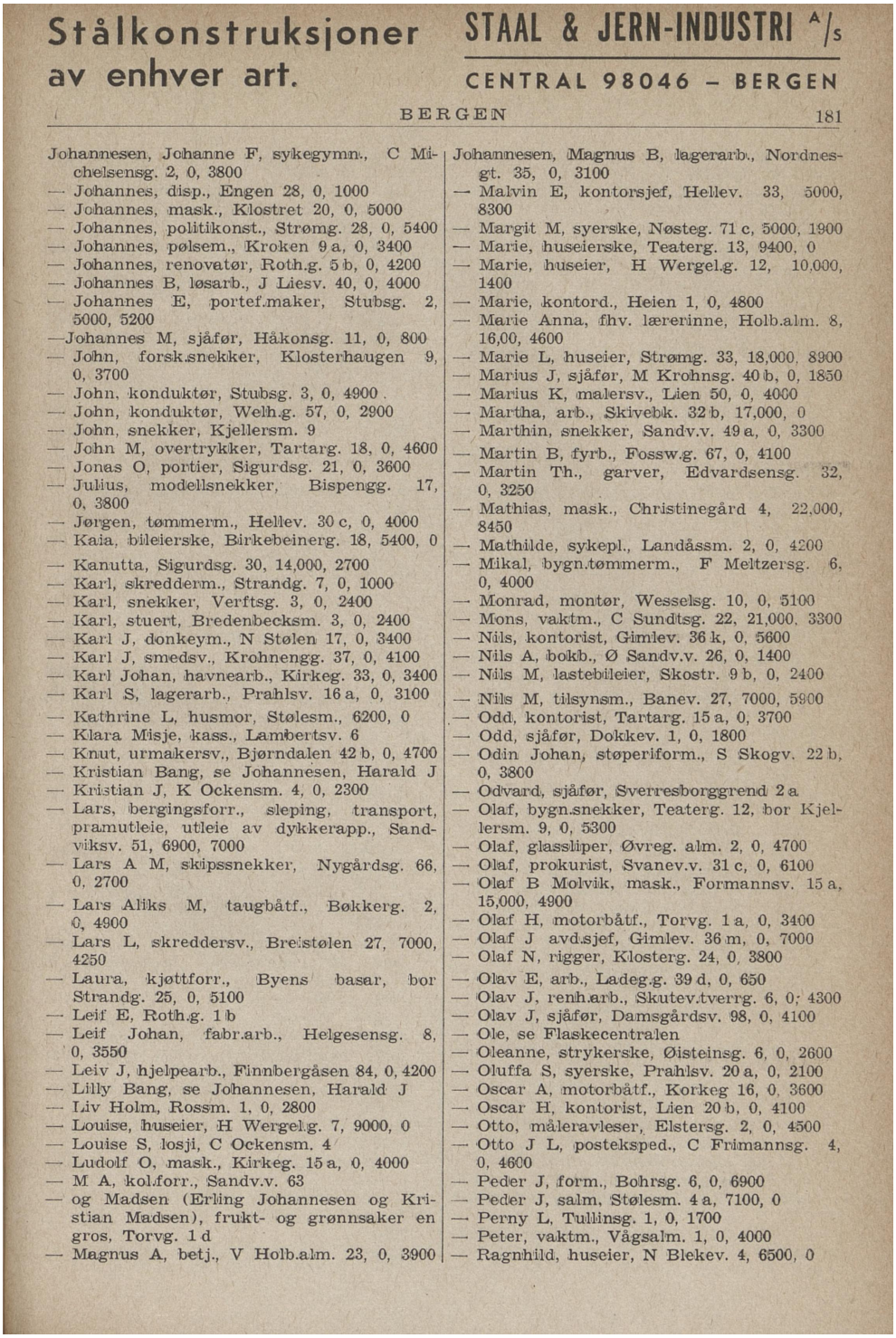
Note: The figure shows Norway's pre-tax income Gini coefficient between 1925 and 2014 as estimated by Abel, Abramitzky and Salvanes (2024). It is based on newly digitized individual-level data (1925-1964) and Norwegian administrative data from the tax authorities (1967-2014).

Figure 2: Gini Coefficient for Age at Death



Note: The figure shows the Gini coefficient for age of death for birth cohorts from 1900 to 1914. Data from 1900-1927 originates from church books and is owned by The National Archives of Norway. Data from 1928-1945 comes from "Folkemengdens Bevegelse" by Statistics Norway. Data from 1951 to 2014 are from the Medical Birth Register (MBRN) from the Norwegian Institute of Public Health.

Figure 3: Example Page from Address Books



Stålkonstruksjoner av enhver art.

STAAL & JERN-INDUSTRI A/S

CENTRAL 98046 – BERGEN

BERGEN 181

Johannesen, Johanne F, sykegymn., C Michelsensg. 2, 0, 3800
— Johannes, disp., Engen 28, 0, 1000
— Johannes, mask., Klostret 20, 0, 5000
— Johannes, politikonst., Strømg. 28, 0, 5400
— Johannes, pølsem., Kroken 9 a, 0, 3400
— Johannes, renovatør, Roth.g. 5 b, 0, 4200
— Johannes B, løsarb., J Liesv. 40, 0, 4000
— Johannes E, portef.maker, Stubsg. 2, 5000, 5200
—Johannes M, sjåfør, Håkonsg. 11, 0, 800
— John, forsk.snekker, Klosterhaugen 9, 0, 3700
— John, konduktør, Stubsg. 3, 0, 4900
— John, konduktør, Welh.g. 57, 0, 2900
— John, snekker, Kjellersm. 9
— John M, overtrykker, Tartarg. 18, 0, 4600
— Jonas O, portier, Sigurdsg. 21, 0, 3600
— Julius, modellsnekker, Bispengg. 17, 0, 3800
— Jørgen, tømmerm., Hellev. 30 c, 0, 4000
— Kaia, bileierske, Birkebeinerg. 18, 5400, 0
— Kanutta, Sigurdsg. 30, 14,000, 2700
— Karl, skredderm., Strandg. 7, 0, 1000
— Karl, snekker, Verftsg. 3, 0, 2400
— Karl, stuert, Bredenbecksm. 3, 0, 2400
— Karl J, donkeym., N Stølen 17, 0, 3400
— Karl J, smedsv., Krohnengg. 37, 0, 4100
— Karl Johan, havnearb., Kirkeg. 33, 0, 3400
— Karl S, lagerarb., Prahlsv. 16 a, 0, 3100
— Kathrine L, husmor, Stølesm., 6200, 0
— Klara Misje, kass., Lambertsv. 6
— Knut, urmakersv., Bjørndalen 42 b, 0, 4700
— Kristian Bang, se Johannesen, Harald J
— Kristian J, K Ockensm. 4, 0, 2300
— Lars, bergingsforr., sleping, transport, pramutleie, utleie av dykkerapp., Sandviksv. 51, 6900, 7000
— Lars A M, skipssnekker, Nygårdsg. 66, 0, 2700
— Lars Aliks M, taugbåtf., Bøkkerg. 2, 0, 4900
— Lars L, skreddersv., Breistølen 27, 7000, 4250
— Laura, kjøttforr., Byens basar, bor Strandg. 25, 0, 5100
— Leif E, Roth.g. 1 b
— Leif Johan, fabr.arb., Helgesensg. 8, 0, 3550
— Leiv J, hjelpearb., Finnbergåsen 84, 0, 4200
— Lilly Bang, se Johannesen, Harald J
— Liv Holm, Rossm. 1, 0, 2800
— Louise, huseier, H Wergel.g. 7, 9000, 0
— Louise S, losji, C Ockensm. 4
— Ludolf O, mask., Kirkeg. 15 a, 0, 4000
— M A, kol.forr., Sandv.v. 63
— og Madsen (Erling Johannesen og Kristian Madsen), frukt- og grønnsaker en gros, Torvg. 1 d
— Magnus A, betj., V Holb.alm. 23, 0, 3900
Johannesen, Magnus B, lagerarb., Nordnesgt. 35, 0, 3100
— Malvin E, kontorsjef, Hellev. 33, 5000, 8300
— Margit M, syerske, Nøsteg. 71 c, 5000, 1900
— Marie, huseierske, Teaterg. 13, 9400, 0
— Marie, huseier, H Wergel.g. 12, 10,000, 1400
— Marie, kontord., Heien 1, 0, 4800
— Marie Anna, fhv. lærerinne, Holb.alm. 8, 16,00, 4600
— Marie L, huseier, Strømg. 33, 18,000, 8900
— Marius J, sjåfør, M Krohnsg. 40 b, 0, 1850
— Marius K, malersv., Lien 50, 0, 4000
— Martha, arb., Skivebk. 32 b, 17,000, 0
— Marthin, snekker, Sandv.v. 49 a, 0, 3300
— Martin B, fyrb., Fossw.g. 67, 0, 4100
— Martin Th., garver, Edvardsensg. 32, 0, 3250
— Mathias, mask., Christinegård 4, 22,000, 8450
— Mathilde, sykepl., Landåssm. 2, 0, 4200
— Mikal, bygn.tømmerm., F Meltzersg. 6, 0, 4000
— Monrad, montør, Wesselsg. 10, 0, 5100
— Mons, vaktm., C Sundtsg. 22, 21,000, 3300
— Nils, kontorist, Gimlev. 36 k, 0, 5600
— Nils A, bokb., Ø Sandv.v. 26, 0, 1400
— Nils M, lastebileier, Skostr. 9 b, 0, 2400
— Nils M, tilsynsm., Banev. 27, 7000, 5900
— Odd, kontorist, Tartarg. 15 a, 0, 3700
— Odd, sjåfør, Dokkev. 1, 0, 1800
— Odin Johan, støperiform., S Skogv. 22 b, 0, 3800
— Odvard, sjåfør, Sverresborggrend 2 a
— Olaf, bygn.snekker, Teaterg. 12, bor Kjellersm. 9, 0, 5300
— Olaf, glassliper, Øvreg. alm. 2, 0, 4700
— Olaf, prokurist, Svanev.v. 31 c, 0, 6100
— Olaf B Molvik, mask., Formannsv. 15 a, 15,000, 4900
— Olaf H, motorbåtf., Torvg. 1 a, 0, 3400
— Olaf J avd.sjef, Gimlev. 36 m, 0, 7000
— Olaf N, rigger, Klosterg. 24, 0, 3800
— Olav E, arb., Ladeg.g. 39 d, 0, 650
— Olav J, renh.arb., Skutev.tverrg. 6, 0, 4300
— Olav J, sjåfør, Damsgårdsv. 98, 0, 4100
— Ole, se Flaskecentralen
— Oleanne, strykerske, Øisteinsg. 6, 0, 2600
— Oluffa S, syerske, Prahlsv. 20 a, 0, 2100
— Oscar A, motorbåtf., Korkeg 16, 0, 3600
— Oscar H, kontorist, Lien 20 b, 0, 4100
— Otto, måleravleser, Elstersg. 2, 0, 4500
— Otto J L, postekspedf., C Frimannsg. 4, 0, 4600
— Peder J, form., Bohrsg. 6, 0, 6900
— Peder J, salm, Stølesm. 4 a, 7100, 0
— Perny L, Tullinsg. 1, 0, 1700
— Peter, vaktm., Vågsalm. 1, 0, 4000
— Ragnhild, huseier, N Blekev. 4, 6500, 0

Note: The figure show a page from an address book with information from tax records. Source: *Adressebok for Hordaland fylke og Bergen med skatteligninger. 1942 Vol. 14* (1942).

taxed individually, but wives were taxed jointly with their husbands and children below 15 with their parents.

3.2 Fuzzy String Matching and the Intergenerational Sample

This paper links the historical tax register to Norwegian register data using fuzzy string matching. This is challenging because the historical income data doesn't include any information on the place or date of birth, which is typically used when linking together population censuses (Abramitzky et al., 2021). In the following, I detail how I perform the linking and give descriptive statistics on matching rates and the balance of the linked sample.

I require the first letter of the first and last name to match perfectly across the two matched sources. This is justified by the observation that the first letter is unlikely to be digitized incorrectly as it is capitalized. It also massively reduced the number of possible matches we need to investigate. I do not have information on the date of birth for both sources, but I restrict possible matches in the administrative data to those between the ages of 15 and 75. Given these restrictions, I estimate the Jaro-Winkler string distance for all potential matches – a score equal to zero if there is no overlap and one if the match is perfect. I require matches to be better than 0.9 to characterize it as a match. Contrary to the census linking literature, I do not require matches to have a string distance with some arbitrary distance to the next best match. This is because the data are digitized from printed records, and I expect very few transcription errors (Abel and Salvanes, 2024).[3]

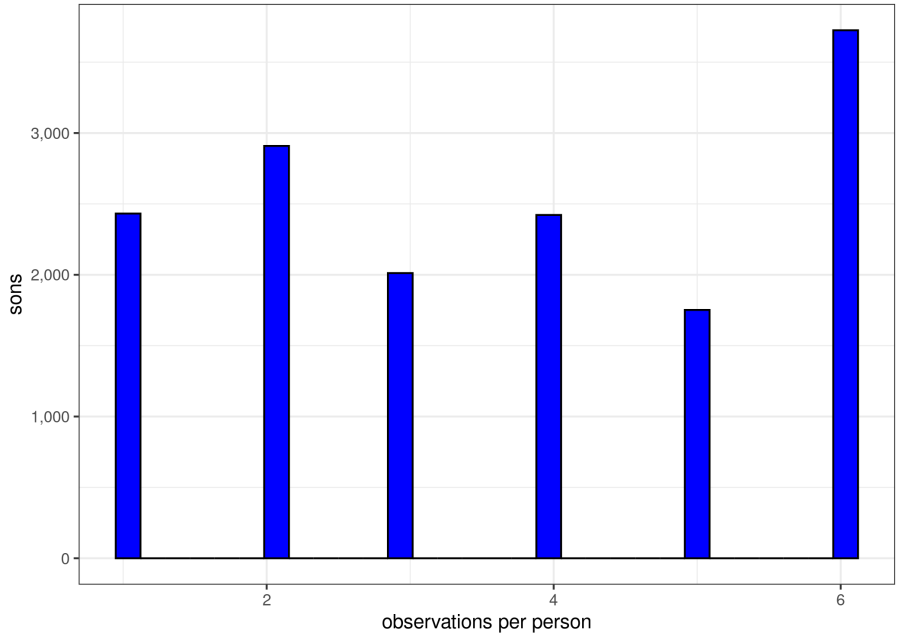
Figure 5 shows matching rates between the historical and administrative data. It fluctuates between 28 percent for 1925 and 33 percent for 1932 and gradually increases from the late 1930s to the 1960s. I present descriptive statistics for the various stages of data processing in Table 1. The initial sample contains about 24 million observations, of which about 8 million are observations created from interpolation. Linking this dataset with the Norwegian administrative data leaves 7.3 million observations or 5.1 million when a perfect match is required. The historical dataset is reduced significantly to about 15.000 observations once linking sons with fathers and averaging incomes between the ages of 30 and 35 for sons and 55 to 60 for fathers. Each family contains observations from, on average, three observations for the father and three for the son, as seen in Figure 4.[4]. The linked sample has higher incomes but lower wealth than the full sample. The family sample is also significantly less urban, with a share of only 15 percent, compared to 23 percent in the full sample. The share of males in the full sample is about 83 percent, but all females are filtered out in the family sample as it is currently too small to construct meaningful estimates.

[3]The current linking setup does not use information on municipality or county of residence, primarily because I lack high-quality data on people's places of residence in the register data from before 1967. I am waiting for this data and expect it to increase the quantity and quality of my matches significantly (Norsk Regnesentral, 2023).

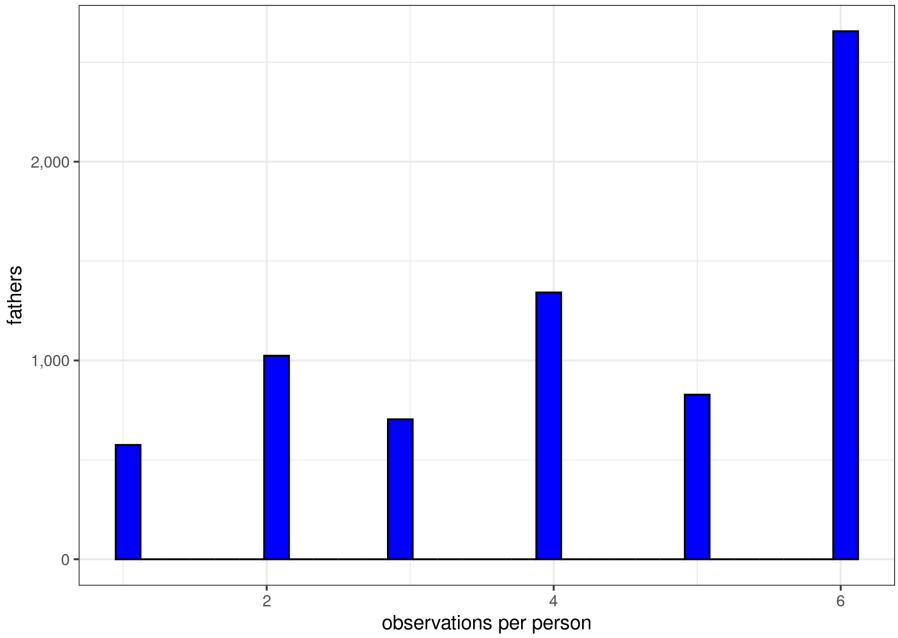
[4]These numbers are impacted by limited data on family ties for cohorts born before 1940. I expect the sample to increase significantly once I get this data through the Norwegian Historical Population Register (Norsk Regnesentral, 2023).

Figure 4: Observation Per Person in the Family Sample

(a) Sons

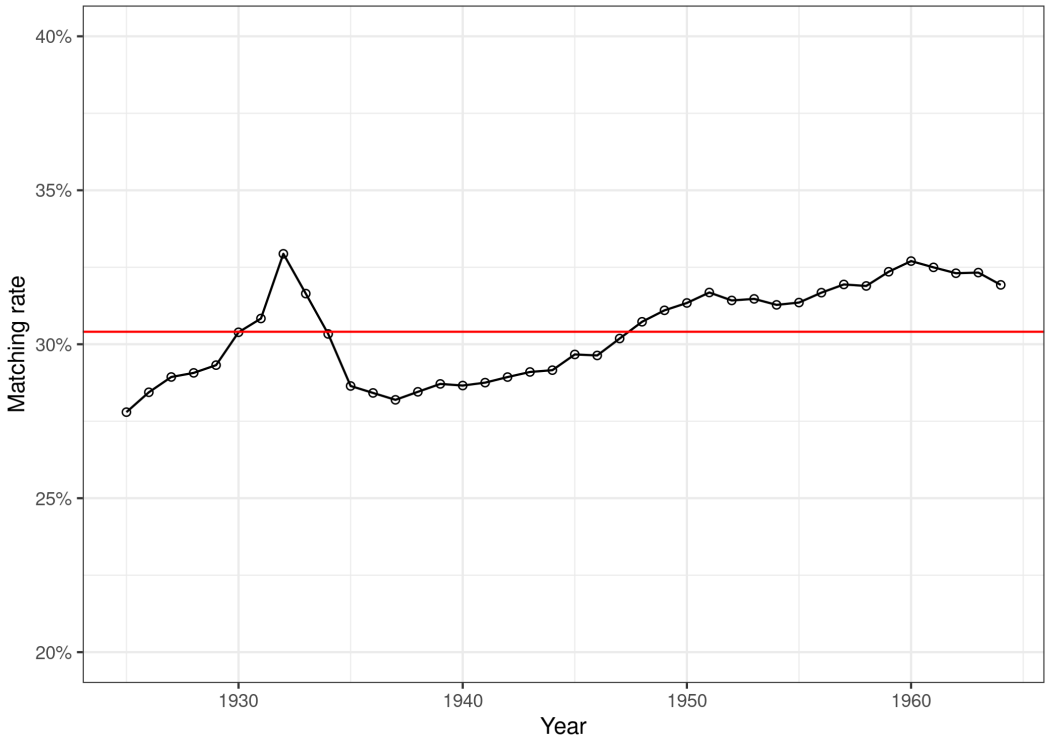


(b) Dads



Note: The figures show the number of observations for each father and son in the family sample. Sons are measured at age 30-35, and fathers are measured at age 55-60.

Figure 5: Matching Rates



Note: The figure shows matching rates between the historical and administrative data as a fraction of the yearly observations in the historical tax data. The cutoff for the Jaro-Winkler string distance is set to 0.9.

Table 1: Summary Statistics of Key Samples

	Full	**Linked (0.9)**	**Linked (1)**	**Families**
income	3,315	3,274	3,500	4,049
wealth	6,173	6,239	6,291	3,948
urban	0.23	0.21	0.21	0.15
male	0.83	0.80	0.84	1.00
N	24,454,033	7,299,628	5,088,246	15,252

Note: This table shows descriptive statistics for the historical tax data (full), the sample linked to administrative data with a Jaro-Winkler string requirement of 0.9 and 1, and the linked sample with average incomes for sons and fathers (families). Numbers are averages for the different samples. Averages for income and wealth are calculated using inflation-adjusted numbers.

3.3 Modern Administrative Data and Family Ties

The link with modern administrative data allows me to include data on younger generations, income after 1967, and educational attainment. Educational attainment is obtained from the 1960, 1970, and 1980 population censuses and the educational register, which is maintained by Statistics Norway. Unfortunately, we don't have register data for individuals who migrated or died before the 1960s. Statistics Norway maintains the modern population register, which includes the personal identifier of the parents of most individuals born after the 1960s.

4 Relative Intergenerational Mobility in Income

This section presents the main descriptive results. I start by estimating conventional rank-rank mobility estimates for incomes, combining modern administrative data with novel historical data described in Section 3. The data sources and linking practices introduce sample selections, and I implement a series of different weighting schemes to account for this. Then, I perform a series of sample splits to understand better where income persistence across generations comes from and focus mainly on the rural-urban divide. Finally, I decompose mobility rates by rural and urban areas and estimate the contribution of the rural-urban divide to the rank-rank persistence in income across generations.

4.1 Levels and Trends in Rank-Rank Persistence in Income

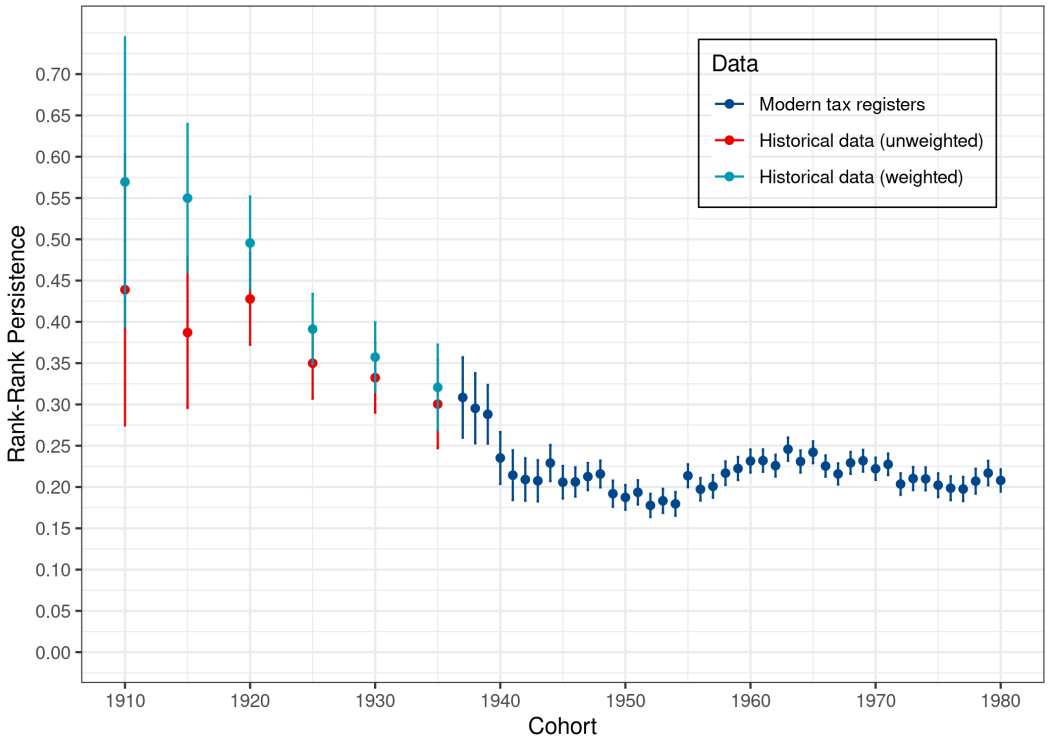
I estimate intergenerational persistence in income using income ranks calculated within income year and five-year birth cohort bins. All estimates are currently restricted to fathers and sons due to data limitations. Income ranks are averaged across all available observations between the ages of 30 and 35 for sons and 55 to 60 for fathers. Each estimate is from a separate regression estimated in five-year bins for the historical data and yearly for the modern data. The estimated regression is as follows:

$$\text{Child Rank}_i = \alpha + \beta \times \text{Parent Rank}_i + \epsilon_i \tag{1}$$

where Child Rank$_i$ and Parent Rank$_i$ are the income rank for child i and the parent of child i, respectively. β is the parameter of interest and should be interpreted as the increase in the expected income rank of the child by moving up the income rank by one percentage point. α is the expected income rank for someone growing up with a dad in the lowest income rank. An alternative setup would be to estimate the relationship between log incomes. However, the rank-rank estimate has the property that it is independent of changes in the variance of log income across generations. We present estimates of the intergenerational income elasticity using log income in the appendix. Importantly, none of these estimates should be interpreted causally but as correlations.

Estimates of the unweighted intergenerational rank-rank persistence in income for sons in cohorts born between 1910 and 1980 are shown in red and blue in Figure 6. Bars show 95 percent confidence intervals. The unweighted rank-rank persistence using historical data starts at around 0.4 for sons from 1910 to 1920 and then declines until the last cohorts in the historical dataset born in the early 1930s. Estimates of rank-rank persistence for cohorts born in the late 1930s use modern administrative data and do not need re-weighting. It continues the falling trend from previous cohorts, but is relatively stable for cohorts born after the 1950s. Figure A.1 in the appendix includes estimates of the intergenerational income elasticity using log income showing similar trends.

Figure 6: Relative Intergenerational Mobility in Income



Note: The figure shows long-run trends in relative intergenerational persistence in income between fathers and sons. Income is pre-tax and pre-transfers. The x-axis denotes the birth cohort of the child. Estimates are from Equation 1. See section 3 for more information on the data.

The linked sample might not correctly reflect the composition of the full population, either because of biased matching or missing data from particular regions or cities. The weighted estimates in Figure 6 are weighted to reflect the actual distribution of taxpayers across municipalities. The re-weighting strengthens the downward trend in persistence for cohorts born 1910-1925 and, particularly, increases estimates of persistence for earlier birth cohorts. I perform a series of alternative weighting schemes and present the results in Table 2 for both by five-year bins of sons' year of birth and the full historical sample (estimates using log income are presented

in Figure A.1 in the appendix). Weights for occupation, municipality and county are based on the composition of the full unlinked historical sample. The urban weights are based on aggregate statistics from Statistics Norway from 1938 to reflect Norway as a whole rather than the unlinked sample (SSB, 1940). The results for the five-year bins are noisy, but for the full sample, I find that weighting by municipality, county and rural status increases persistence rates across generations. Weighting by occupation leads to a slight decrease in measured persistence rates. However, this might be caused by the fact that not all occupations are present in the linked sample. I am, therefore, unable to fully account for differences in occupational composition. Re-weighting is not necessary with modern data, as matching rates are 100 percent and fully represent the composition of the full population.

The historical estimates will inevitably be impacted by linking and digitization errors, but when comparing estimates for cohorts born in the 1930s, we find that the historical and modern datasets produce relatively similar estimates. However, while the matching errors are nonexistent in the modern sample, they are not in the historical sample. Assuming that the matching errors are random, this will tend to bias rates of persistence toward zero; however, how much is challenging to say without a clear idea of the rates of false matches in the historical data. Any correction for this would likely make the fall in persistence for cohorts born between the 1920s and 1950s even more dramatic, assuming that matching quality worsens further back in time. To minimize bias in my results, I currently require the match to be perfect (the name strings have to be identical) for the estimate in Figure 6, but I still expect some false matches. A survey of papers using fuzzy matching techniques suggests that the rate of false matches can be from 16 percent to more than half of the sample when matching across population censuses (Bailey et al., 2020). Assuming a rate of false matches in this interval, I should adjust the estimated intergenerational persistence rates by between 19 and 100 percent.[5]

A comparison with other countries in the early 1900s is difficult because few estimates of persistence in income across generations exist. In a study linking the 1915 Iowa census with the 1940 US census, Feigenbaum (2018) estimates a rank-rank persistence of 0.26 for cohorts born in this period, suggesting that Norway was significantly less mobile than the US. However, newer work by Jácome, Kuziemko and Naidu (2021) using survey data with income for sons and imputed income for fathers finds rates of rank-rank persistence of 0.37. This is still lower than my estimate for Norway, but within the 95 percent confidence interval[6].

[5]Adjustment factor = 1/(1-error rate) assuming that false matches are random.

[6]The estimate by Feigenbaum (2018) seems to match evidence on occupational mobility (Ferrie, 2005; Long and Ferrie, 2013) that finds high levels of mobility compared to European countries, which gradually decline over time. However, new evidence from Ward (2021) corrects for measurement errors in occupational titles and finds a pattern similar to that of Jácome, Kuziemko and Naidu (2021), with low levels of mobility in the early 1900s and then a substantial increase.

Table 2: Re-Weighting Rank-Rank Measures

	1910	1915	1920	1925	1930	1935	Full sample
No weights:							
	0.439	0.387	0.428	0.350	0.332	0.300	0.352
	(0.085)	(0.047)	(0.028)	(0.022)	(0.022)	(0.027)	(0.012)
Weights:							
by occupation	0.446	0.455	0.482	0.337	0.297	0.274	0.342
	(0.086)	(0.043)	(0.028)	(0.022)	(0.022)	(0.027)	(0.012)
by municipality	0.569	0.550	0.496	0.391	0.357	0.321	0.386
	(0.090)	(0.046)	(0.029)	(0.022)	(0.022)	(0.026)	(0.012)
by county	0.435	0.479	0.471	0.371	0.346	0.313	0.375
	(0.078)	(0.047)	(0.029)	(0.022)	(0.021)	(0.027)	(0.012)
by urban status	0.419	0.486	0.511	0.402	0.345	0.322	0.392
	(0.090)	(0.047)	(0.027)	(0.022)	(0.021)	(0.027)	(0.012)
by mun. and urban status	0.561	0.653	0.520	0.412	0.355	0.313	0.399
	(0.119)	(0.052)	(0.031)	(0.023)	(0.022)	(0.027)	(0.012)

Note: The table presents rates of rank-rank persistence for five-year bins of the son's birth cohorts and the full sample with a selection of weighting schemes. Standard errors are in parenthesis.

Table 3: Sample Splits

	1910	1915	1920	1925	1930	1935	Full sample
rural	0.450	0.331	0.382	0.318	0.316	0.286	0.326
	(0.088)	(0.049)	(0.030)	(0.023)	(0.023)	(0.029)	(0.012)
urban	-0.255	0.719	0.370	0.256	0.185	0.416	0.303
	(1.080)	(0.303)	(0.117)	(0.096)	(0.072)	(0.087)	(0.044)
primary school	0.447	0.413	0.441	0.336	0.323	0.267	0.344
	(0.104)	(0.053)	(0.033)	(0.026)	(0.026)	(0.034)	(0.014)
more schooling	0.293	0.239	0.364	0.312	0.339	0.301	0.322
	(0.144)	(0.115)	(0.063)	(0.048)	(0.044)	(0.051)	(0.024)
no wealth	0.245	0.298	0.448	0.321	0.257	0.389	0.328
	(0.147)	(0.137)	(0.085)	(0.061)	(0.055)	(0.074)	(0.031)
some wealth	0.483	0.399	0.425	0.357	0.339	0.285	0.353
	(0.102)	(0.049)	(0.030)	(0.023)	(0.023)	(0.029)	(0.012)

Note: The table presents rates of rank-rank persistence for five-year bins of the son's birth cohorts and the full sample with a selection of sample selections. Standard errors are in parenthesis.

I explore heterogeneity in Table 3 by re-estimating rates of intergenerational rank-rank persistence with sample splits based on rural status, education and wealth (estimates using log income are presented in Table A.2 in the appendix). While persistence rates for the five-year bins are noisy, some interesting patterns emerge for the full sample. Rural areas are less mobile than urban areas, with intergenerational persistence of 0.32 and 0.30, respectively, similar to what Feigenbaum (2018) find for the US. Rates of persistence are somewhat higher for those with only primary schooling than those with more, but the difference is not statistically significant. The population with some non-zero wealth has the highest persistence rates, with 0.35 compared with 0.32 for those without wealth.

4.2 The Rural-Urban Divide

The fact that the rank-rank coefficient for the full sample is larger than that of both rural and urban areas separately means that level differences in income ranks between the areas drive part of the persistence. To investigate this further, I plot the average income rank for children by their father's location in the income distribution in Figure 7 and do it separately for fathers living in rural and urban areas. The slope of these lines will be equal to the group-specific rank-rank persistence between fathers and sons. To compare changes over time, I show separate panels for the historical sample (cohorts 1910-1935) and the modern sample (1937-1964). In the historical sample, sons growing up in cities do better in terms of income than those growing up in a rural area, even if their fathers have the same income (see panel a). The grey dashed line is the joint regression line whose slope equals the intergenerational persistence for the combined sample. This line is steeper than the line for rural and urban areas. For cohorts born 1937-1964 (see panel b), the level difference is almost completely gone, and the combined line has a slope similar to the urban and rural lines.

The explanation is that dads from urban areas have significantly higher average income ranks.[7] One can easily imagine that this point holds more generally for many groups: as income inequality between groups is reduced, the persistence of income decreases. To understand the drivers of the reduction in persistence, I decompose the persistence into drivers related to the rural or urban status of the father's municipality of residence. I start with Jácome, Kuziemko and Naidu (2021), who arrive at the following equation for decomposing into groups $g \in G$:[8]

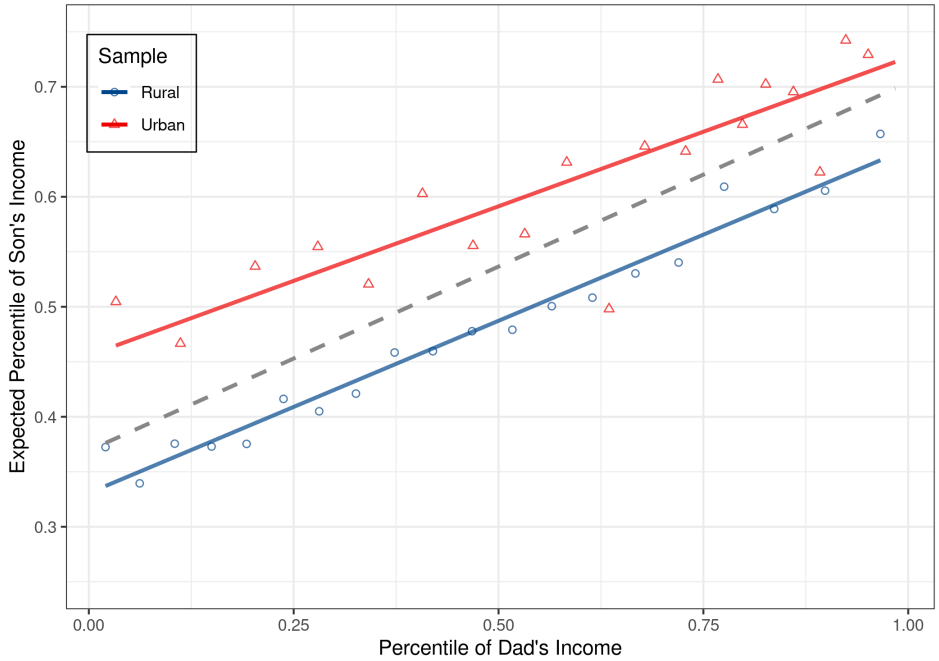
$$\gamma^{\mathrm{RR}} = \underbrace{12 \times \sum_g p_g \operatorname{Var}(\mathrm{Rank}^p \mid g)\, \gamma_g^{\mathrm{RR}}}_{\text{weighted slopes}} + \underbrace{12 \times \sum_g p_g \mathrm{E}\left[\mathrm{Rank}^p \mid g\right] \mathrm{E}[\mathrm{Rank} \mid g] - 3}_{\text{level effect}} \tag{2}$$

[7]This point is similar to that of Jácome, Kuziemko and Naidu (2021), who looks at intergenerational mobility in income in the US and the income gap between the white and black part of the population.

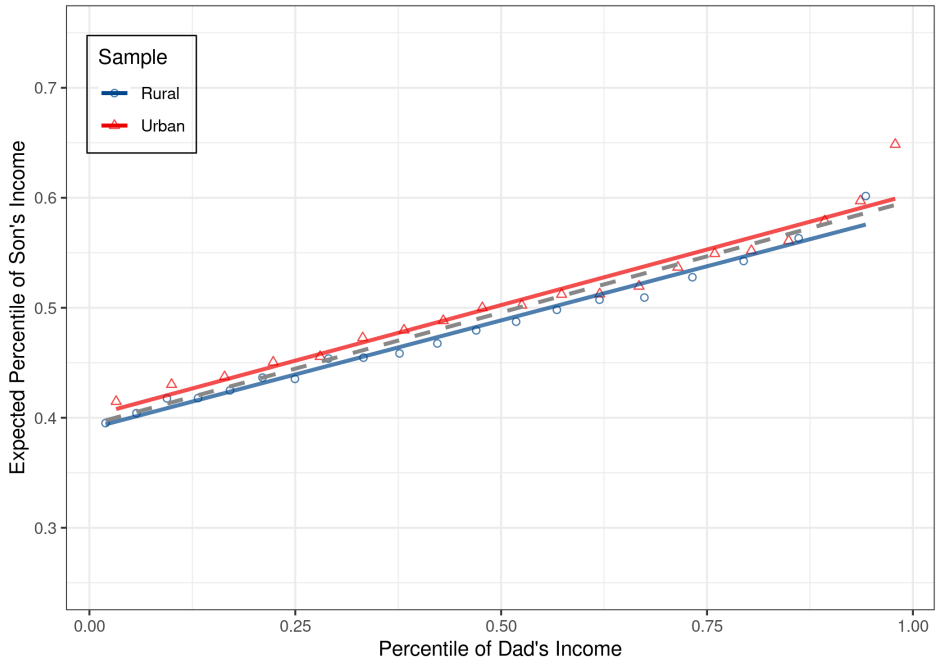
[8]The original decomposition comes from Hertz (2008).

Figure 7: Rank-Rank Persistence By Rural Status

(a) Cohorts 1910-1935



(b) Cohorts 1937-1964



Note: The figures show average income ranks for sons by their father's place in the income distribution and father's place of residence. The two figures for cohorts born 1910-1935 and 1937-1964 represent the historical and modern samples, respectively. The grey dashed line is the join regression line, and its slope reflects the join intergenerational persistence.

where γ^{RR} is the rank-rank persistence for the full population, and $Rank^p$ and $Rank$ is the income rank of the parent and child, respectively. γ_g^{RR} is the persistence within subgroup g and p_g is the groups fraction of the total sample. The two terms translate into a weighted average of the group-specific slopes and a between-group component. This decomposition gives an intuition as to why the income gap between urban and rural areas (shown in Figure 7) leads to higher persistence across generations. Any increase in the difference between expected income ranks in rural and urban areas will increase the between-component of the estimated intergenerational persistence in income rank.

We know that income inequality was dramatically reduced in Norway between the late 1930s and 1950s, and the convergence between rural and urban areas was one of the most important drivers (Abel, Abramitzky and Salvanes, 2024). I use a simplified version of the decomposition presented in Equation 2 to understand the effect of the compression between urban and rural areas on intergenerational persistence. I use the unlinked dataset to calculate expected incomes for fathers and sons, assuming that their expected income rank is similar to the group they belong to (rural or urban) and people migrating from a rural (urban) area to an urban (rural) area have the same expected income rank as the existing population in that location.[9] I use incomes for fathers and sons from the same year so that the connection between persistence rates and income inequality is clearer. A full decomposition is currently not possible due to the size of the historical sample. However, the primary objective is to identify trends and large fluctuations in the contribution of income differences between rural and urban areas. Estimates of the level effect are presented biennially in Figure 8, starting at almost 16 percent and showing a massive decline in the between-group component of rank-rank persistence. World War II stands out as the largest single contributor to the decline, and the level differences between rural and urban areas were virtually gone by the 1970s – suggesting that the convergence between rural and urban areas can account for about a 15 percentage point decrease in rank-rank persistence in this period.[10] I do not currently estimate the contribution of the group-specific persistence rates because the urban estimates are too noisy, and I would need to use the linked sample.

5 Mechanisms

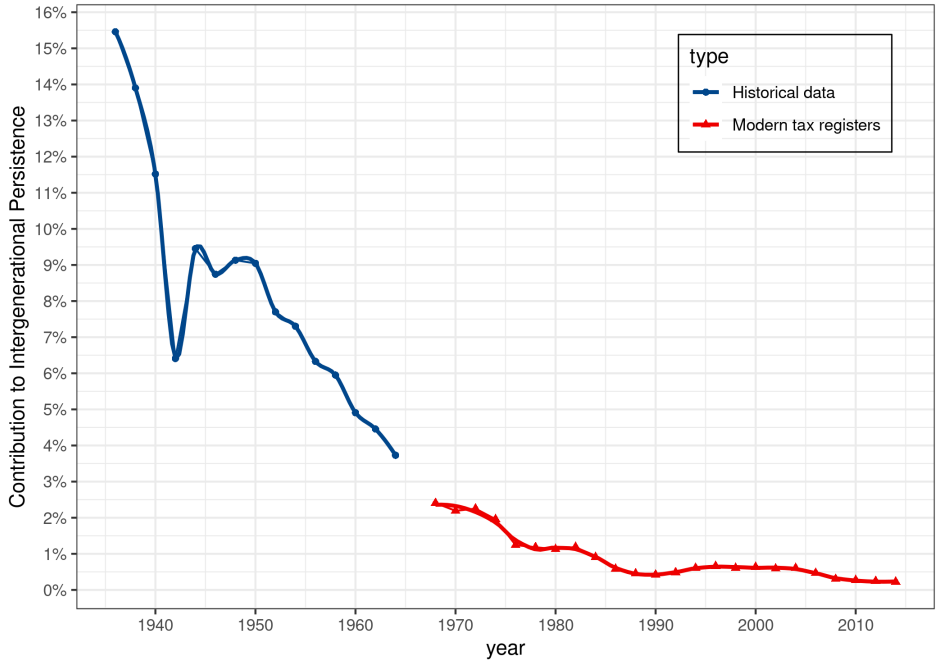
I have established that rates of relative intergenerational mobility in income in Norway were much lower in the early 1900s than today, and that a large increase in mobility happened for cohorts born between 1920 and 1940. I showed that a convergence between rural and urban areas caused a drop in the rank-rank persistence of up to 15 percent throughout this period. In this section,

[9] I fix the migration rates to 10 percent, meaning that the percentage of sons born to dads from rural areas that move to urban areas is 10 percent, and vice versa.

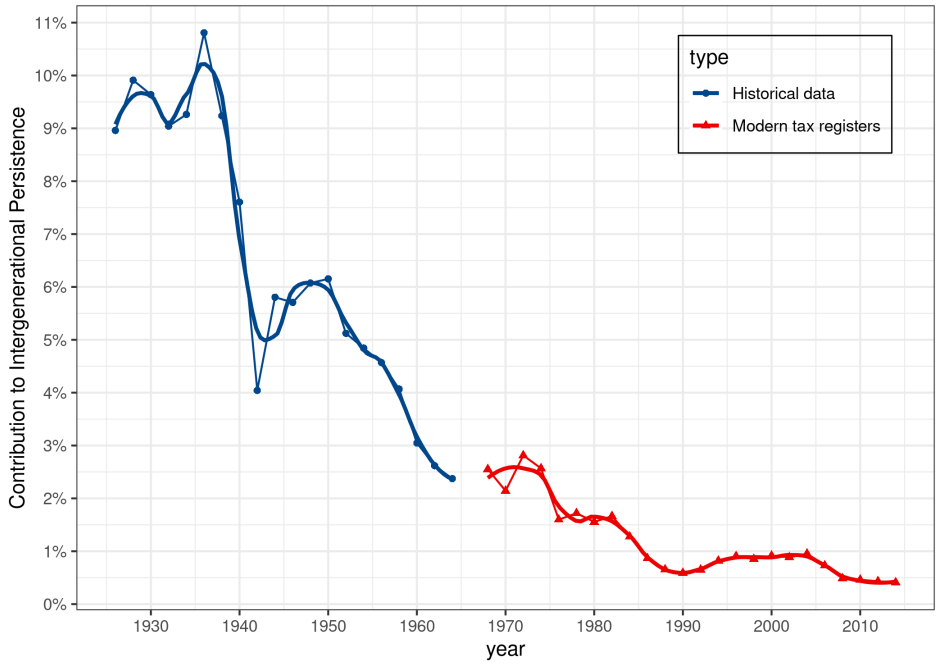
[10] There are some changes in the municipality structure in the late 1950s and early 1960s that leads to some areas changing their classification from rural to urban, which are not yet taken into account.

Figure 8: Persistence Due to Level Differences Between Rural and Urban Areas

(a) 1935-2014



(b) 1925-2014



Note: The figures shows the contribution of the level difference in expected income rank between rural and urban areas to rank-rank persistence across generations based on a simplified version of the decomposition proposed by Jácome, Kuziemko and Naidu (2021). Samples are chosen to cover a consistent set of counties over time. See text for more information.

I investigate possible mechanisms behind this effect. We can consider possible mechanisms as either pre-market, labor market or post-market. I focus on the two first by looking at education (pre-market) and a change in the wage structure (labor market). I do not look at the direct effect of post-market factors as my measure of income is pre-tax and includes few transfers.

5.1 The Role of Education

This section investigates the development of rural and urban education in Norway over the 1900s and its impact on intergenerational income mobility. I provide a brief overview of educational differences between rural and urban areas in Norway during the 20th century. Then, I estimate the causal effect of an increase in the intensity of primary schooling in this period on intergenerational mobility using the 1936 rural primary school reform.

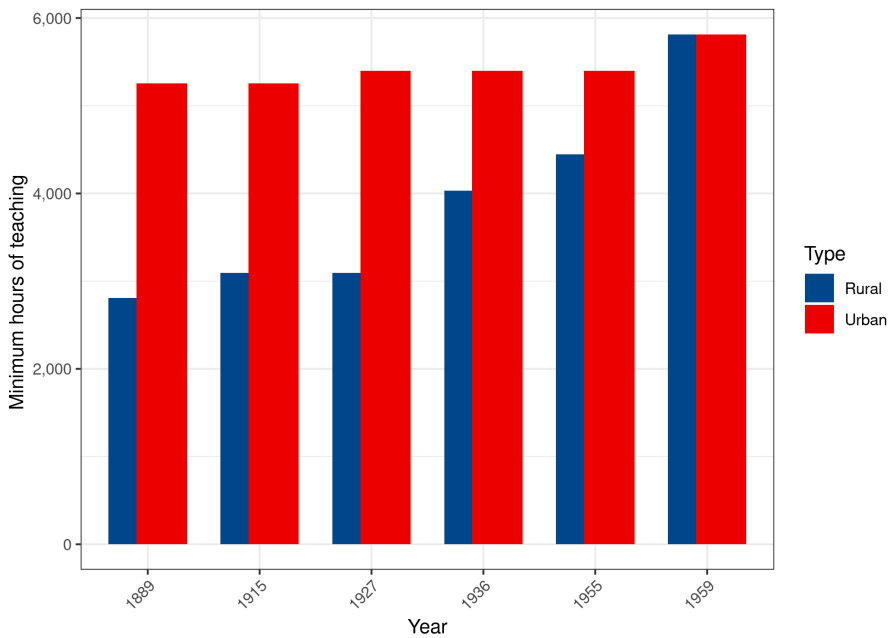
5.1.1 History and Background of the Education System

Schooling in rural and urban areas was highly segregated in the first part of the 1900s, with one law governing the rural primary schools and one governing urban schools (Acemoglu et al., 2021). Hours of schooling per week were higher in rural schools, but weeks of schooling in cities were substantially higher, giving pupils in cities almost twice as many hours in school in the late 1800s. This was justified by the supposedly lower need for schooling in rural areas and the need for children to help out at home. However, it made it difficult for pupils from rural schools to pursue higher education.

The rural and urban schooling systems started converging following the 1936 rural primary school reform, which was the first step towards a unified primary schooling system (Acemoglu et al., 2021; Abel, Buetikofer and Salvanes, 2023). The reform increased central financing for schools, decreased maximum class sizes and, most importantly, increased the minimum number of weeks of schooling during a year by around four weeks (about 30 percent). Figure 9 shows minimum hours of schooling in rural and urban school districts. Minimum hours of schooling in rural and urban primary schools had been virtually constant since the last extensive primary school reform in 1889, with rural schooling providing around 55 percent of that in urban schools. The 1936 rural primary school reform increased rural schooling to about 75 percent of urban schools. The gap was not closed before 1959, when primary schooling became governed by the same law, providing a minimum of 5,814 hours of schooling during primary school (Acemoglu et al., 2021).

There was a large convergence in educational attainment between rural and urban areas, starting with cohorts born in the 1920s. I plot differences in the shares of people born in rural and urban areas with 7, 8-12 and 13 or more years of education in Figure 10a. It shows that gaps in educational attainment started out large across all groups for cohorts born in the 1910s and were gone for cohorts born in the late 1960s. The convergence began with individuals born in rural areas

Figure 9: Minimum Hours of Teaching During Primary School



Note: The figure show the minimum allowed hours of schooling during primary school for rural and urban areas between 1889 and 1959. *Source*: Acemoglu et al. (2021).

increasingly getting 8-12 years of schooling (middle school), and they were overrepresented in this group from the cohorts born in the 1930s and onwards. The final wave of convergence occurred for cohorts born between the early 1940s and late 1960s, when pupils born in rural areas moved into higher education (here defined as 13 or more years of completed education). Measured in years of schooling, the difference in educational attainment between rural and urban areas shown in Panel b increased for cohorts born up until the 1920s, and it didn't decrease significantly until cohorts born in the 1940s. The gap in completed years of education was gone in the late 1970s.

One channel through which changes in education could impact intergenerational persistence in income is through changing the persistence in years of education. I estimate the persistence in education between fathers and sons as follows:

$$\text{Child Education}_i = \alpha + \beta \times \text{Parent Education}_i + \epsilon_i \tag{3}$$

where Child Education$_i$ and Parent Education$_i$ are the years of completed education for child i and the parent of child i, respectively. β is the parameter of interest and should be interpreted as the persistence in years of education across generations. The results are estimated in 5-year birth cohort bins and shown in Figure 11. I find that rates of persistence in years of education decreased throughout the century, from almost 0.6 for sons born in the 1910s and 1920s to about

0.3 for sons born since the late 1950s. Most of the fall seems to happen for cohorts between 1940 and 1960, which coincides with the convergence in years of schooling between rural and urban areas. The levels and trends closely match similar estimates for Denmark (Karlson and Landersø, 2021). While persistence rates for father-son and father-daughter pairs were similar in the last half of the century, they were substantially lower for daughters in the first part of the century, possibly reflecting changes in gender roles throughout the century.

5.1.2 Empirical Strategy

I estimate the causal effect of education on intergenerational persistence using the 1936 rural primary school reform as an exogenous source of variation in quantity and quality of schooling (Acemoglu et al., 2021; Abel, Buetikofer and Salvanes, 2023). The reform increased the minimum allowed weeks of schooling for rural municipalities in Norway and increased funding for schools, teachers and teaching materials. I follow Acemoglu et al. (2021) and Abel, Buetikofer and Salvanes (2023) and use an intensity of treatment design to estimate the causal effect of the reform. The reform had a different 'bite' depending on how many weeks of schooling the municipality had to increase teaching to reach the new minimum. The minimum weeks of schooling were 12 (1-3 grade) and 14 (4-7 grade) weeks before the reform and 16 (1-3 grade) and 18 (4-7 grade) weeks after the reform. Let $b_j^{\text{små}}$ be the increase necessary in weeks of schooling for 1-3 grade and b_j^{stor} the necessary in weeks of schooling for 4-7 grade. The intensity of treatment for municipality j is then given by P_j:

$$P_j = \frac{3 \times b_j^{\text{små}} + 4 \times b_j^{stor}}{28} \tag{4}$$

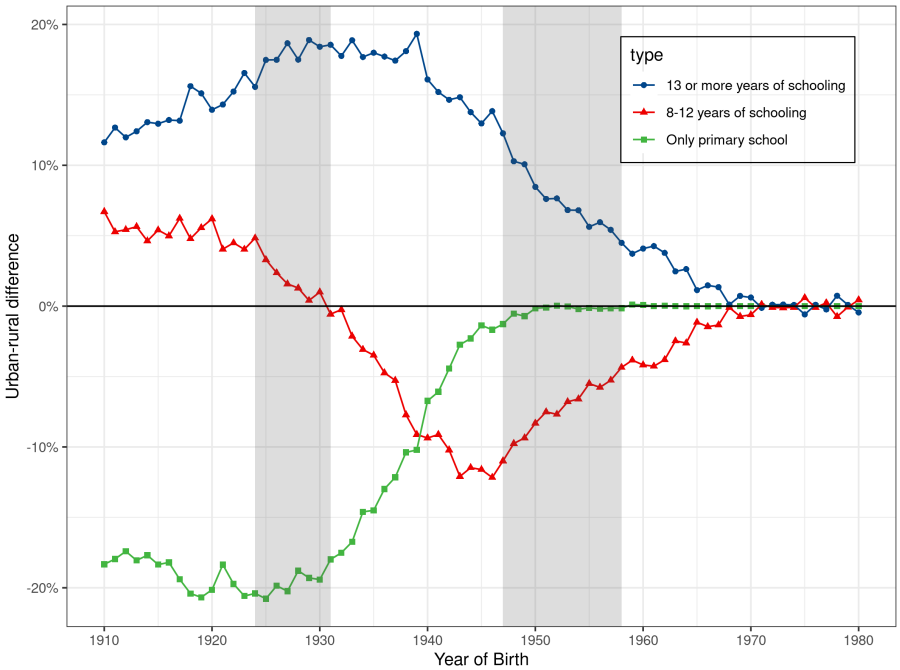
where P_j can be interpreted as the share of the full reform experienced by pupils starting primary school in municipality j after the reform is implemented. This reform intensity is correlated with school size, which was reduced as a part of the reform, which means that our causal estimate will pick up parts of this quality component of the reform in addition to the quantity dimension (Acemoglu et al., 2021; Abel, Buetikofer and Salvanes, 2023). In addition to the geographical variation, exposure to the reform varies by how many of your seven years in primary school occurred in the reformed school system. The measure Z_{jt} is the share of the full reform (going from the old minimum to the new minimum) experienced by cohort t in municipality j. Similar to Acemoglu et al. (2021) and Abel, Buetikofer and Salvanes (2023), I calculate it as:

$$Z_{jt} = \frac{\sum_{a=5}^{7} b_j^{\text{små}} \mathbb{1}(treat_t = a) + \sum_{a=1}^{4} b_j^{stor} \mathbb{1}(treat_t = a)}{28} \tag{5}$$

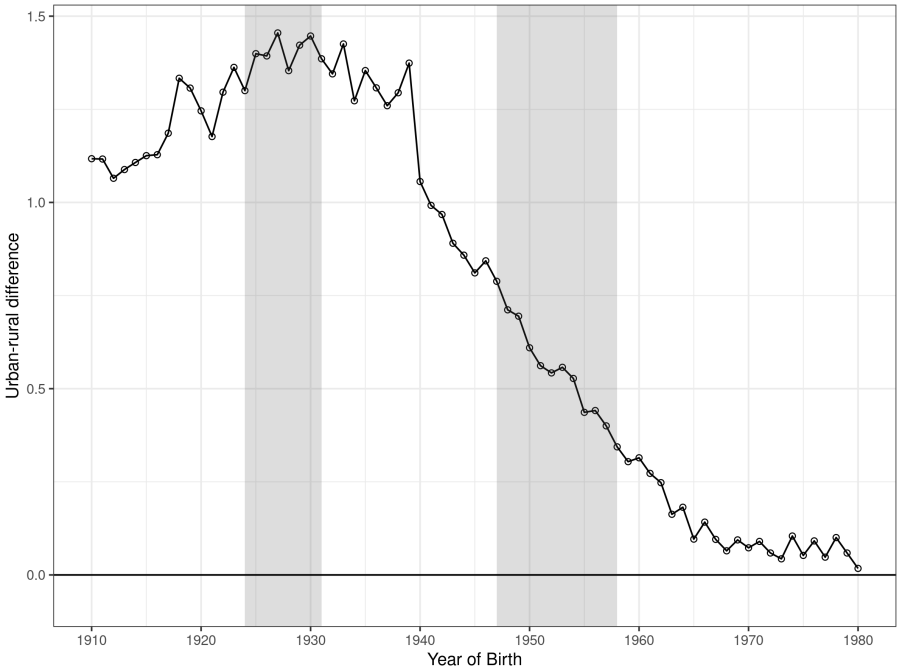
where $\mathbb{1}(treat_t = a)$ indicate whether individual i experienced a years of schooling in the reformed primary school system. My regression setup assumes that the impact of the reform is linear in

Figure 10: Rural-Urban Educational Divide

(a) Percentage points difference between rural and urban

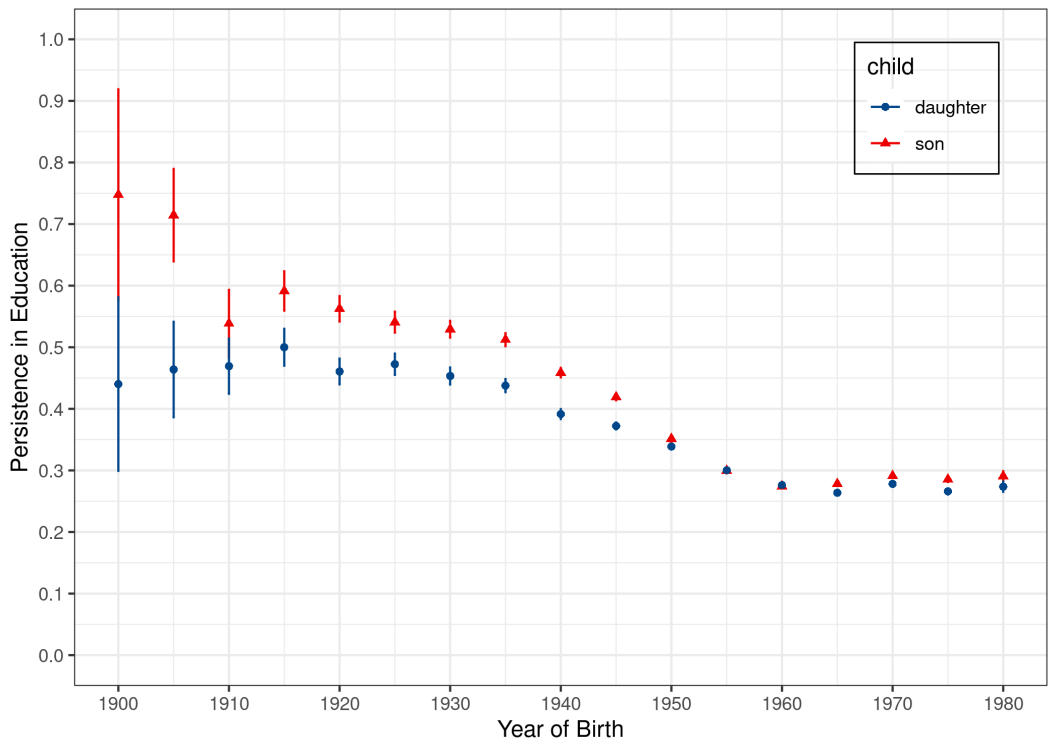


(b) Mean difference in years of education



Note: The figures show the gap between urban and rural areas in the percentage point with different educational attainment and the average difference in years of schooling. Individuals are characterized based on the status of their municipality of birth. Shaded areas are cohorts affected by the 1936 primary school reform and the change in compulsory schooling from 7 to 9 years in the 1960s.

Figure 11: Relative Intergenerational Persistence in Years of Education



Note: The figure shows intergenerational persistence in years of education between fathers and children (sons and daughters) from estimating Equation 3.

treatment intensity. In my first regression setup, I estimate the impact of the reform on individual incomes specified as follows:

$$Y_{ijt} = \alpha + \beta Z_{jt} + \sum_{l} \gamma_l (d_l \times \mathbf{X_j}) + \theta_j + \eta_t + \varepsilon_{ijt} \tag{6}$$

where the term $d_l \times \mathbf{X_j}$ is the interaction between year-of-birth fixed effects and certain municipality-level control variables, allowing the effect of the controls to vary by birth cohort. The coefficient β is of primary interest as it quantifies the effect of transitioning from the previous legal minimum requirement to the updated requirements. Based on the linearity assumption, the influence of progressing from 1 to 2 years of education under the reformed system is equivalent to that of advancing from 6 to 7 years.

When estimating the impact of the reform on intergenerational persistence, I interact the reform exposure with the father's outcome Y_{ijt}^{father}.[11] I use sons born between 1910 and 1950. The regression looks like the following:

[11]This setup is similar to that if Bütikofer, Dalla-Zuanna and Salvanes (2022); Karlson and Landersø (2021); Pekkarinen, Uusitalo and Kerr (2009).

$$Y_{ijt}^{son} = \alpha + \beta_0 Y_{ijt}^{father} + Y_{ijt}^{father} \times \beta_1 Z_{jt} + \beta_2 Z_{jt} + \sum_l \gamma_l (d_l \times \mathbf{X_j}) + \theta_j + \eta_t + \varepsilon_{ijt} \tag{7}$$

were β_1 is the reform's effect on intergenerational persistence. If the reform disproportionately increases outcomes at the lower part of the distribution, we would expect this term to be negative. The regression flexibly controls for a range of pre-determined municipality-level characteristics through $d_l \times \mathbf{X_j}$, as well as the direct effect of the reform on individual i that is unrelated to the father's outcome ($\beta_1 Z_{jt}$). Income ranks are averaged at ages 30 to 35 for sons and 55 to 60 for fathers, similar to in Equation 1, while education is measured as years of completed education for both sons and fathers.

5.1.3 Results

Table 4 presents results for both education and income. Starting with years of education in column 1, I find that the reform increased years of education by 0.57 years of schooling. This increase is somewhat larger than the one found in previous papers and less precise because of the smaller sample linked to their fathers (Abel, Buetikofer and Salvanes, 2023). In column 2, I estimate the reform's effect on intergenerational mobility in education but find no statistically significant effect. This is somewhat surprising given the effect on years of education, but is consistent with the flat development in the persistence of education observed in Figure 11 for these cohorts.

Table 4: Causal Effect of 1936 Primary School Reform

	(1) Education child	(2) Education child	(3) Income rank child	(4) Income rank child
Reform	0.589***		0.077***	
	(0.121)		(0.012)	
Edu. dad		0.462***		
		(0.007)		
Edu. dad × reform		0.009		
		(0.015)		
Income dad				0.214***
				(0.013)
Income dad × reform				−0.053*
				(0.023)
Observations	54.519	54.067	54.552	28.246
FE: Cohort	X	X	X	X
FE: Birthplace	X	X	X	X

+ p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001

Note: The table shows results from estimating Equation 6 and Equation 7 and years of education and income ranks. Data includes males born between 1910 and 1950, and only the dad's education and income are used. Significance levels: + p < 0.1, * p < 0.05, ** p < 0.01, *** p < 0.001.

In column 3, I find that the reform increased income ranks by 5.8 percentage points, a smaller effect than in previous research using average income over a more extended period (Abel, Buetikofer and Salvanes, 2023). In column 4, I find a negative impact of the primary school reform on intergenerational persistence in income of 5.3 percentage points, statistically significant at the 10 percent level. This suggests that reform increased incomes for sons with low-income fathers more than others. These estimates are less precise than wanted because of the limited sample size but indicate that the primary school reform impacted intergenerational persistence in income. The small sample size makes it difficult to produce clear event-study results with the intergenerational sample, which would be necessary to alleviate concerns about the parallel trend assumptions. However, Acemoglu et al. (2021) and Abel, Buetikofer and Salvanes (2023) present robustness checks and event-study results for a range of outcomes for the sons, finding robust effects on labor market outcomes, education and family formation.

5.2 The Role of the Wage Structure

Section 4 documents the occurrence of both a decrease in the persistence of income between generations and a decrease in income inequality in Norway during the 20th century. Literature on the so-called "Great Gatsby Curve" suggests a causal relationship between the two, but it is unclear through what mechanisms a change in the wage structure could impact intergenerational mobility in income (Corak, 2013). One channel could be through changes in the returns to education, which could impact persistence either through changing the incentives to pursue additional education or by directly changing the incomes of already educated individuals.

5.2.1 Measuring the Returns to Education

I start by estimating the yearly returns to education in Norway between 1925 and 2014 and use the historical tax register developed in Abel and Salvanes (2024) linked with administrative data and completed years of education. The sample is selected to represent a consistent geographical area throughout the period and is weighted to reflect the ratio of rural to urban inhabitants in Norway. I estimate the following Mincer equation separately for every year:

$$\ln(\mathrm{Y})_i = \alpha + \beta \mathrm{education}_i + \gamma_1 \mathrm{experience}_i + \gamma_2 \mathrm{experience}_i^2 + \epsilon_i \tag{8}$$

where $\ln(\mathrm{Y})_i$ is log income for person i restricted to males between the ages of A and B. The experience is calculated as the potential years of experience given an individual's year of birth (Mincer, 1974).[12] The coefficient of interest is the returns to years of education β, which can be interpreted as the percent increase in income associated with a one-year increase in education.

[12]Calculated as experience = age − 7 − years of education.

The returns to years of education are shown in Figure 12. It fluctuated from more than 15 percent in the mid-1930s to almost 5 percent in 1980. The majority of this fall came in the years between 1935 and 1942. During the beginning of the German occupation of Norway in 1940, the returns to years of education started dropping sharply, following a similar dramatic fall in income inequality (Abel, Abramitzky and Salvanes, 2024). This appears to be driven by a convergence between the incomes of those with primary schooling, lower secondary schooling and high school on one side and those with college and university degrees on the other, as seen in Figure 13, which show incomes of the most common educational groups relative to those with only primary schooling.

The second fall happened between 1970 and 1980, typically seen as the end of the post-war era and the start of Norwegian oil and gas production, which increased wages of the low-skilled (Bütikofer, Dalla-Zuanna and Salvanes, 2022). Like in other Western countries, I find that the returns to education started to trend upwards in the 1980s, likely due to skill-biased technological change and later due to increased exposure to international trade (Goldin and Katz, 2009; Balsvik, Jensen and Salvanes, 2015). The return to education is today back to levels last seen in the decades following World War II.

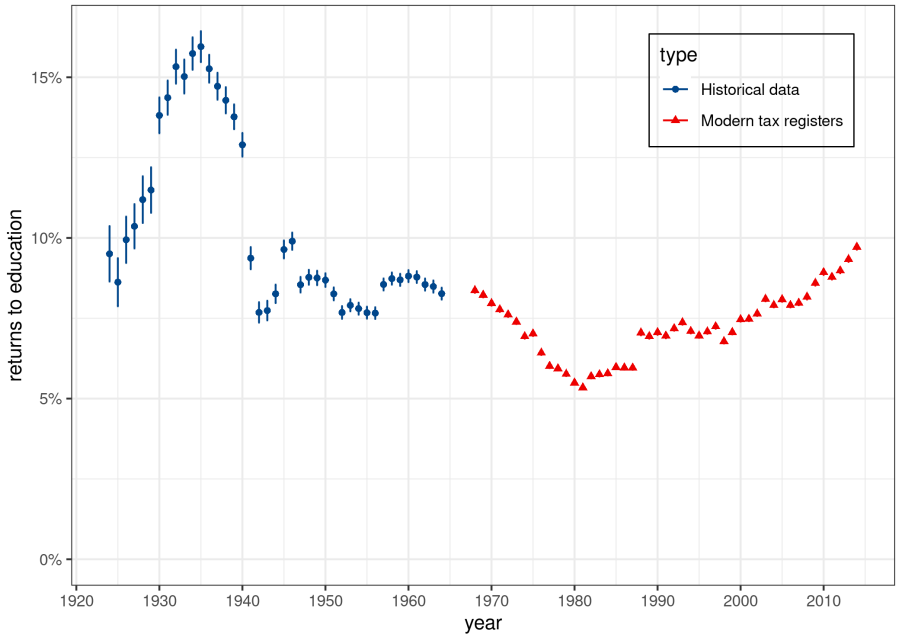
It is unclear if we should think of the development in the returns to education since 1935 as the start of a new area or the return to one with low levels of returns to education. I find relatively low levels of returns in the 1920s, which increased sharply between 1925 and 1935. The 1920s was a particularly turbulent period in the Norwegian economy, starting with a post-war recession, severe deflation and a debt crisis. Tides had turned by 1930, the strongest boom for the Norwegian economy ever recorded, with GDP levels more than 8 percent above trend (Eika, 2008). Considering the turbulent times and the findings by Minde (1998) of declining returns to education since the late 1800s, it is likely that returns before and during World War I were significantly higher than in the 1920s, and we should consider the levels during the 1930s as closer to the 'old' normal.

5.2.2 The Impact on Intergenerational Mobility

In a model of intergenerational mobility where income is determined at least partly by educational attainment, a change in the returns to education can impact rates of relative intergenerational mobility in income. An increase in the returns to education would, for example, result in non-borrowing-constrained parents increasing investments in their child's human capital (Abramitzky and Lavy, 2014). Alternatively, higher returns to education would tend to increase rates of intergenerational persistence if ability is strongly inherited across generations.

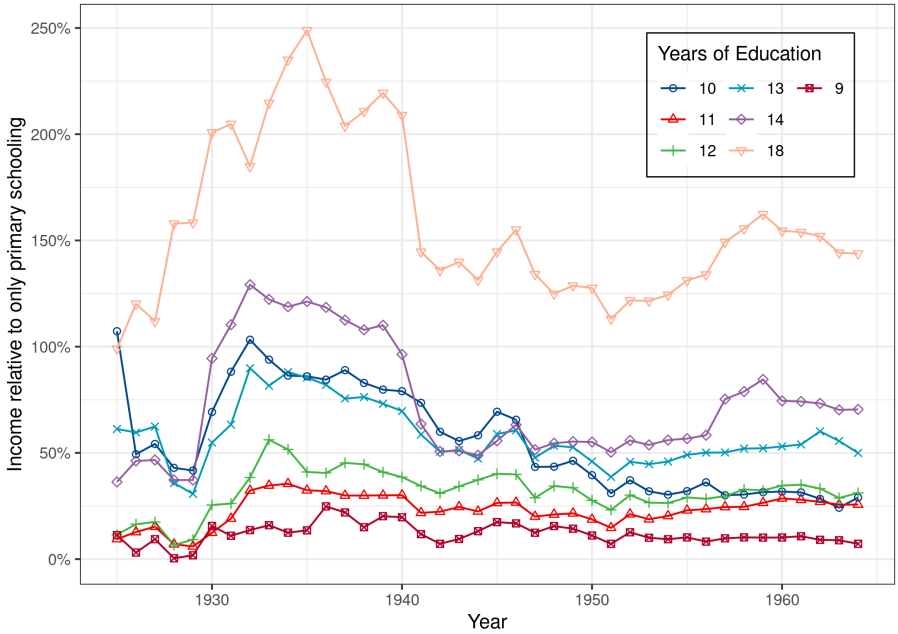
Identifying either of these effects is challenging because we usually do not have exogenous variation in the returns to schooling across cohorts or years. I use the sharp change in wage structure following the onset of World War II in Norway and estimate the direct – or mechanical –

Figure 12: The Returns to Years of Education



Note: The figure shows the estimated returns to a year of additional education from a standard Mincer equation as described in the text (see Equation 8). The sample includes data from the historical and modern tax registers and includes males only.

Figure 13: Income Relative to Primary School



Note: The figure shows average incomes for different completed years of education relative to those with only primary school. The sample is males only.

effect on intergenerational mobility. I do this by estimating several intergenerational mobility rates for a set of father-son pairs, changing only the year for which the father's income is measured. This should ensure that the only thing changing is the wage structure in which the fathers' income is measured. In other words, levels of human capital are held constant. Observations on fathers are always based on historical tax data, while observations on sons are based on modern administrative data between 1970 and 1975. The sample is restricted to individuals observed just before and after the shock.

I plot estimates of rank-rank persistence in Figure 14 with red lines representing averages before and after the shock, excluding 1940[13]. I find that rank-rank persistence in income decreased from about 30 percent before World War II to 26 percent after 1940 – representing a 13 percent drop in persistence. I argue that the effect is likely to be driven by the change in returns to education, but it could also more broadly reflect changes in the wage structure during the beginning of World War II.[14] Results using intergenerational income elasticity (IGE) and the intergenerational income correlation (IGC) are presented in the appendix in Figure A.2. I find no effect on persistence using IGE, but a meaningful effect when using IGC. The difference is driven by a dramatic decrease in the variance of log income following the onset of World War II in Norway. This relationship follows because IGC is equal to IGE $\times \frac{\sigma_y p}{\sigma_y}$, where σ_y^p and σ_y is the standard deviation of the log income of the dad and son, respectively. A large decrease in σ_y^p following the onset of World War II will, therefore, decrease the IGC.

6 Conclusion

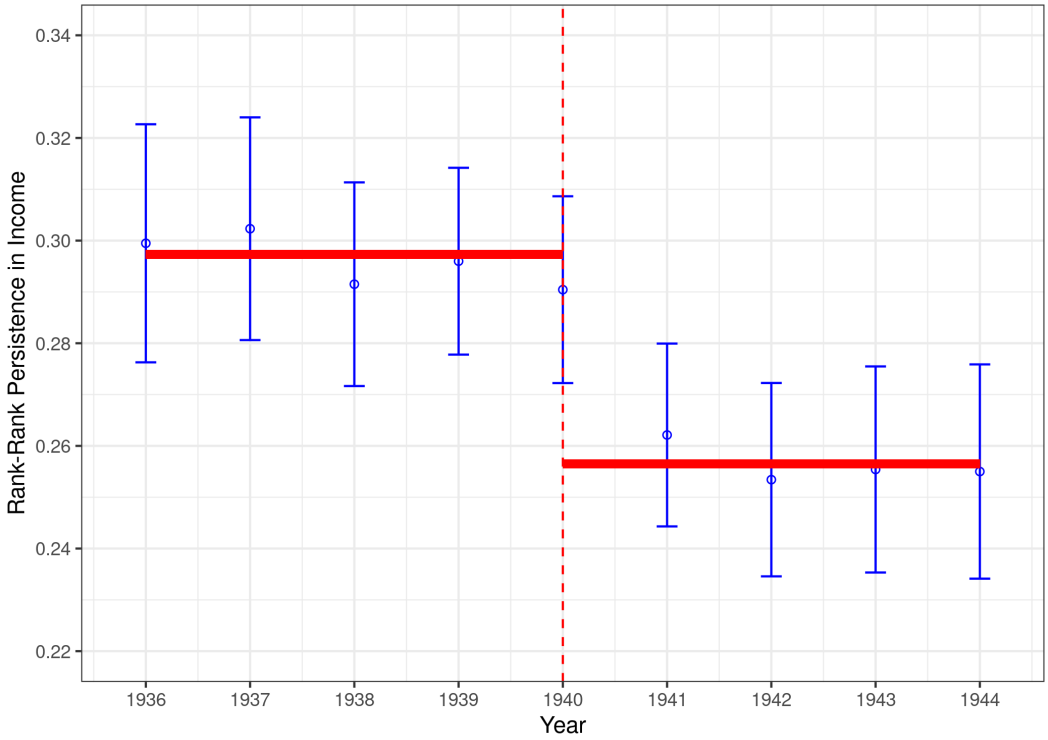
In cross-country comparisons, the Nordic welfare states outrank most other countries on measures of relative intergenerational mobility in income – meaning that relative incomes in Norway, Denmark and Sweden are less tied to that of their parents than in almost any other country. This has led to strong interest from researchers and policymakers in understanding the causes behind the high mobility rates. Existing evidence shows that trends in intergenerational mobility in income in the Scandinavian countries have been flat for male cohorts born between 1951 and 1979 (Ahrsjö, Karadakic and Rasmussen, 2023). If the welfare state increased mobility, it must have happened for earlier cohorts.

This paper studies long-run trends in intergenerational mobility in income for cohorts born from 1910 to 1980 and examines its determinants. I find that persistence in income rank across generations for cohorts born in the 1910s and 1920s was more than twice as high as today's – with a rank-rank persistence of about 0.55 compared to 0.20 today. The decrease in persistence is isolated

[13]The occupation started in April 1940, and Norwegian forces finally capitulated June 1940. The Norwegian economy was at a standstill during this period, but the activity in the economy increased substantially during the fall of 1940.

[14]See Abel, Abramitzky and Salvanes (2024) for more details on this specific shock or Goldin and Margo (1992) on a similar fall in the returns to education in the US.

Figure 14: The Effect of World War II on Intergenerational Persistence



Note: The figure shows rank-rank persistence in income across generations for dads' incomes measured at different years. Red lines are average estimates before and after the shock, excluding 1940.

to cohorts born in the early 1920s to 1940s. This shows that Norway has not always been the mobile society it is today and that this mobility must have been caused by something happening primarily in the first part of the 1900s. I focus on the urban-rural divide and find that cohorts born in cities from 1920 to 1935 earn better than those growing up in rural areas, even if their fathers have the same income. Given a set of assumptions, this reduction has contributed to a 16 percentage point reduction in rank-rank persistence in this period.

I investigate changes in education and the wage structure as two potential mechanisms for the decline in persistence. The education gap between rural and urban areas was large and relatively stable for cohorts born until the 1920s, after which educational attainment started to converge, and the gap was virtually gone for cohorts born in the 1960s. To provide causal evidence of this mechanism, I use the 1936 rural primary school reform in Norway as causal identification and find that it increased incomes significantly and decreased persistence by more than five percentage points. I also investigate the direct effect of a dramatic change in the wage structure during World War II on intergenerational persistence. I find that educational premiums were around 15 percent in the 1930s before dropping sharply at the start of World War II to about 8 percent. Using the

change in wage structure at the start of World War II as a shock, I find that the war significantly reduced persistence in income by around 13 percent.

My findings stand in contrast to some of the previous research, which has used data on occupations from population censuses (Long and Ferrie, 2013; Modalsli, 2017), status information in first names (Olivetti and Paserman, 2015) and rear surnames (Clark, 2015). These methods typically find slow-moving trends or no trends at all, which starkly contrasts the dramatic changes found in this paper. However, my results more closely match recent papers by Ward (2021) and Jácome, Kuziemko and Naidu (2021). My results point to increased access to education and a compressed wage structure as two important drivers behind Norway's transformation into a high-mobility society. However, work remains to be done to fully understand the drivers of the massive changes in mobility that occurred in Norway and many other countries in this period.

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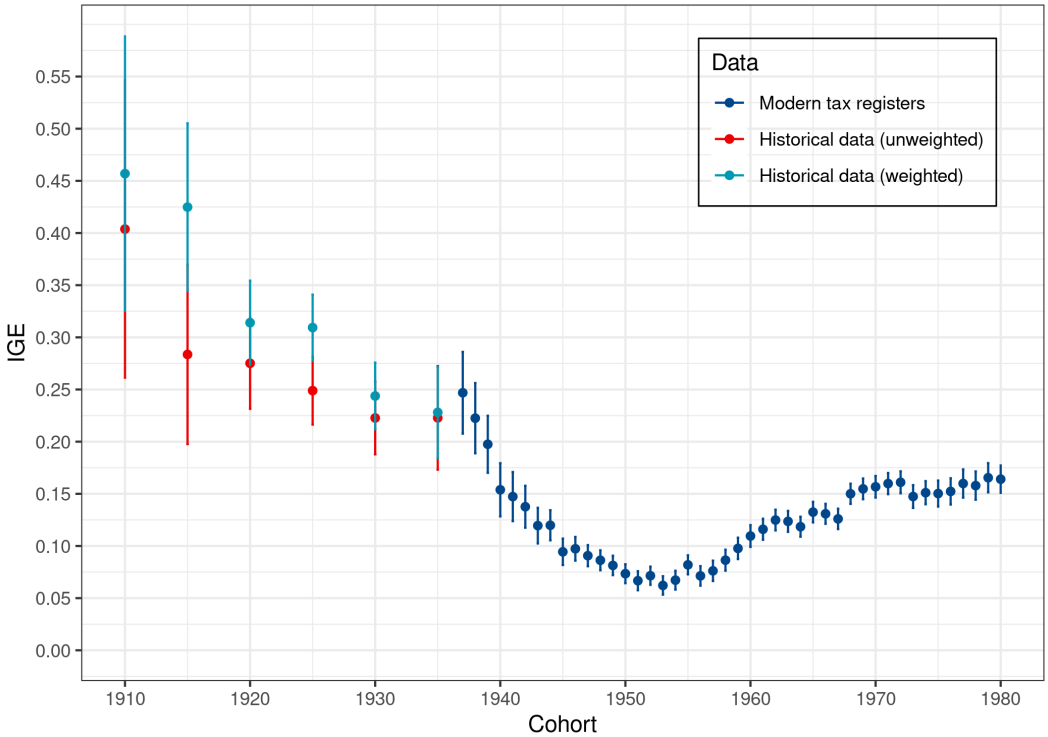
Appendix of:

Living the American Dream:
How Norway Became a High-Mobility Country

Eirik Berger Abel

A Extra Tables and Figures

Figure A.1: Intergenerational Income Elasticity



Note: The figure shows long-run trends in the intergenerational income elasticity between fathers and sons. Income is pre-tax and pre-transfers. The x-axis denotes the birth cohort of the child. Estimates are from Equation 1. See section 3 for more information on empirical setup and data.

Table A.1: Re-weighting Log-Log Income Measures

	1910	1915	1920	1925	1930	1935	Full sample
No weights:							
	0.404	0.284	0.275	0.249	0.223	0.223	0.323
	(0.073)	(0.044)	(0.022)	(0.017)	(0.018)	(0.025)	(0.010)
Weights:							
by occupation	0.460	0.312	0.306	0.256	0.198	0.244	0.320
	(0.069)	(0.043)	(0.022)	(0.016)	(0.017)	(0.027)	(0.010)
by municipality	0.457	0.425	0.314	0.309	0.244	0.228	0.320
	(0.068)	(0.041)	(0.021)	(0.016)	(0.016)	(0.022)	(0.009)
by county	0.358	0.349	0.299	0.266	0.220	0.222	0.320
	(0.060)	(0.042)	(0.022)	(0.016)	(0.017)	(0.024)	(0.009)
by urban status	0.414	0.368	0.321	0.305	0.217	0.242	0.335
	(0.074)	(0.042)	(0.019)	(0.016)	(0.017)	(0.025)	(0.009)
by mun. and urban status	0.512	0.535	0.328	0.378	0.226	0.218	0.329
	(0.084)	(0.045)	(0.018)	(0.015)	(0.016)	(0.022)	(0.009)

Note: The table presents rates of log-log persistence for five-year bins of the son's birth cohorts and the full sample with a selection of weighting schemes. Standard errors are in parenthesis.

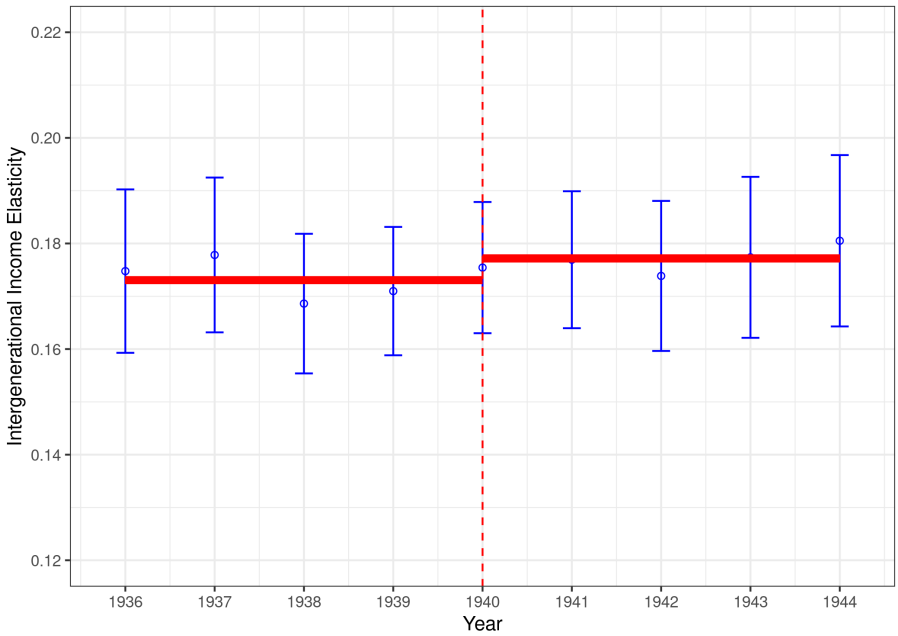
Table A.2: Sample Splits (Log-Log Income Persistence)

	1910	1915	1920	1925	1930	1935	Full sample
rural	0.399	0.236	0.247	0.219	0.219	0.209	0.312
	(0.078)	(0.047)	(0.025)	(0.018)	(0.019)	(0.028)	(0.010)
urban	0.699	0.587	0.248	0.345	0.068	0.289	0.252
	(0.598)	(0.212)	(0.053)	(0.061)	(0.051)	(0.072)	(0.032)
primary school	0.435	0.313	0.264	0.220	0.219	0.185	0.319
	(0.092)	(0.051)	(0.027)	(0.020)	(0.022)	(0.032)	(0.012)
more schooling	0.234	0.144	0.248	0.282	0.221	0.261	0.299
	(0.119)	(0.098)	(0.044)	(0.035)	(0.034)	(0.046)	(0.019)
no wealth	0.404	0.272	0.269	0.228	0.235	0.169	0.312
	(0.090)	(0.054)	(0.027)	(0.020)	(0.024)	(0.035)	(0.012)
some wealth	0.374	0.307	0.287	0.285	0.216	0.277	0.342
	(0.133)	(0.075)	(0.040)	(0.029)	(0.027)	(0.036)	(0.016)

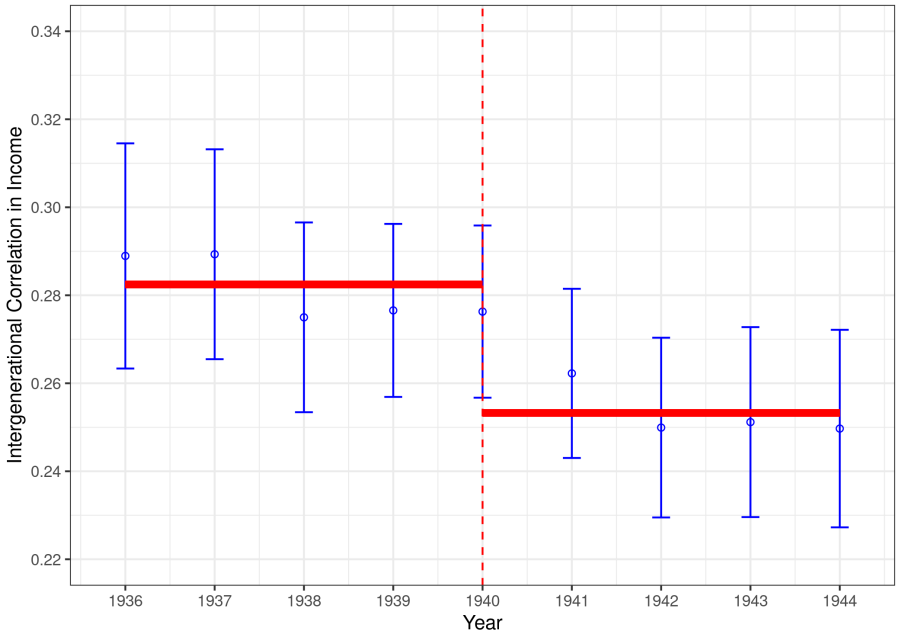
Note: The table presents rates of log-log persistence for five-year bins of the son's birth cohorts and the full sample with a selection of sample selections. Standard errors are in parenthesis.

Figure A.2: The Effect of World War II on Intergenerational Persistence

(a) Intergenerational Income Elasticity (IGE)



(b) Intergenerational Income Correlation (IGC)



Note: The figures show the intergenerational income elasticity and the intergenerational income correlation across generations for dads' incomes measured at different years. Red lines are average estimates before and after the shock, excluding 1940.